# Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

1984, No.1 (February)

Pergamon Press

# CHEMISTRY INTERNATIONAL

## The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Roger Fennell
PRODUCTION EDITOR: Richard J. Palmer

## EDITORIAL ADVISORY BOARD

| | |
|---|---|
| *Chairman:* | T. S. WEST Secretary-General |
| | H. EGAN CHEMRAWN Committee |
| | R. DEGAIN Committee on Chemistry and Industry |
| | D. P. DEN OS Committee on Publications |
| | L. PAOLONI Committee on Teaching of Chemistry |
| | K. L. LOENING Interdivisional Committee on Nomenclature and Symbols |
| | K. S. W. SING Division I |
| | E. FLUCK Division II |
| | N. J. LEONARD Division III |
| | M. MANDEL Division IV |
| | G. DEN BOEF Division V |
| | L. E. COLES Division VI |
| | D. B. TONKS Division VII |
| *Secretary:* | R. W. FENNELL Editor |

## SUBSCRIPTIONS

Six issues of *Chemistry International* will be published in 1984. Annual subscription rate including postage is US$20 for individuals, and US$40 for libraries. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, UK.

## REPRODUCTION OF ARTICLES

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*. Permission to reproduce articles will normally be granted at no cost to non-profit making bodies (such as National Adhering or Associated Organizations of IUPAC, National Chemical Societies, or International Scientific Unions). Permission for commercial publishers will normally be conditional upon publication of an advertisement for IUPAC publications. In all cases, please contact the IUPAC Secretariat for clearance.

**Front cover:** Mrs Ulricke Inglis checks the IUPAC members list.

Pergamon Press

Oxford New York Toronto Sydney Paris Frankfurt

© 1983 International Union of Pure and Applied Chemistry

# EDITORIAL

Opinions expressed here are those of the author, and do not necessarily reflect the views or policy of IUPAC

There were quite a number of newcomers recommended for membership of IUPAC bodies at the recent General Assembly and the majority of these have now been approved by the relevant NAOs. A number of enquiries about membership of Commissions, etc., have been made to the Secretariat so, although the approval processes are not yet quite complete, we are publishing a provisional listing of the members of IUPAC bodies in advance of the definitive lists, which will be presented in the CI Supplement later in the year. Three things have allowed this earlier-than-usual publication of the lists — the better cooperation of IUPAC bodies in providing the information, the newly-acquired word processor in the Secretariat and the devotion to duty of Mrs. Ulrike Inglis in learning to use it so quickly (see front cover).

In this issue we have another article which relates to work of an IUPAC Commission — this time an historical review of atomic weights and of what is now Commission II.1, on Atomic Weights and Isotopic Abundances, by Dr. N. E. Holden. Dare I hope that this will encourage other Commissions and Committees to write something about the background to their work? I am sure your Editorial Advisory Board representative (see inside front cover) would be delighted to receive something from you — and so stop me from pestering him.

Another new departure for us is the not-too-serious treatment of an often irritating problem — the varying styles of scientific journals — brought to our attention by Prof. Battino. I must say that had I still been a practising analyst I could not have agreed with his proposal for the format of references; they should, of course, be in the traditional style of — but I've retired and can cheerfully leave the in-fighting to the rest of you. Do not forget that, if you want to air your views on this, or any other IUPAC-related subject, I shall be pleased to receive and publish your letters.

Finally, a word of explanation on what can be taken as a sign of laziness (you may be right!). Earlier in this Editorial I referred to CI — did anyone *not* realise that I was referring to *Chemistry International?* Similarly, it must be a majority of IUPAC people who refer to the Union's journal *(Pure and Applied Chemistry),* in other than formal references in scientific papers, as PAC. As formal references are the exception rather than the rule in CI, I propose as an experiment to use PAC and CI wherever possible in normal 'business' items. Please let me know if you don't like it.

## Bits and pieces

It is the Editor, not the Secretary General, who has apparently started to lay eggs. The 00 on p.2 (line 5, second paragraph) of the December issue should be 23 and the 00–00 in the second paragraph on p.8 should be 53–54. I hope those of you who like solving riddles enjoyed yourselves and got the right answers, and my apologies to all.

Overheard at the Secretariat staff Christmas lunch:
"Three large women were walking under one umbrella but none of them got wet. Why? — It wasn't raining."
"What is a metronome? — A little man in the Paris underground."
"It'll pour better, Mo, if you take the cork out."

# THE SECRETARY GENERAL'S COLUMN

I have attempted to summarize the contents of this article in a series of five titles which run together to provide a one sentence summary.

## IUPAC (I) announces increased level of activity —

The limited income available to the Union has caused several problems, including a reduction in the size of Division Committees and a 25% cut in the number of Titular Members of Commissions, during the past 2 years — and will do so for the next 2 years. The amount of travelling expenses available to Standing Committee, Commission and Division Committee members attending meetings has also had to be cut back during this period. The reduction in the number of their Titular Members will undoubtedly slow down the work of the Commissions eventually, though I am pleased to be able to report that during the past biennium Commissions have produced more reports than ever before. More seriously, the reduction must necessarily cut down not only the number of top scientists in IUPAC but also the internationality of the Commissions. To some extent the Union has been able to cope with this trend by encouraging Commissions to have up to 12 Associate Members: this achieves the maximum amount of work at the minimum cost to the Union. This perhaps explains why there was an all-time record attendance of members of Commissions at the 1983 General Assembly in Lyngby and it may also explain the increased output. I also get the impression, though it is only a personal one, that there are now more younger chemists in the Commissions than previously.

## (II) Worries about future —

This increased attendance at Assemblies, greater output and (probably) greater number of young chemists sounds very promising for the future of IUPAC. However, there are dangers ahead which should not be obscured by these welcome signs of increased activity. First of all, the Union is relying more and more heavily on Titular Members and Division Committee Members having to contribute to their travelling and subsistence costs. These are the working scientists of the Union on whom it relies for scientific leadership. Titular Members already give of their time freely and generously. Many will continue so to do, but it is not appropriate that, in addition, they should have to pay more out of their own pockets. This developing situation must also create special hardships for chemists from poorer countries and those which have currency conversion restrictions.

Yet again, the outlook for Associates is not as good as it was previously. In the normal course of events an Associate who becomes involved in the Union and works well can reasonably hope to become a Titular Member of the Commission in due course. The emerging situation is that there are now many more Associates (about + 50%) competing for fewer Titular places (–25%) with the knowledge that full travelling expenses and subsistence are less likely to be available to Titular Members than in the past.

Little debate has taken place within the Union on these issues. Much has, however, been said at Council meetings about the cost of National Subscriptions to IUPAC and several countries appear to be seeking ways to reduce the amounts they pay. This is IUPAC's chief source of income and its level of activity will of necessity have to be reduced even further if there is no improvement. Royalties on our publications bring in some additional money, but the aim of the Union has consistently been to maximize dissemination of reports rather than to maximize income from publications. The Divisions in particular already feel that the sale of publications is limited by rather too high costs. Their aim is to ensure that their hard-won recommendations and reports get into as many hands as possible.

Obviously the limited funds available to IUPAC will be the subject of major debate within the Union and, I hope, amongst National Adhering Organizations (NAOs) in the next year or so.

## (III) Axes its Executive —

Meanwhile, the Officers have had the difficult task of allocating funds to the Divisions and Standing Committees of the Union. The budget for the biennium 1984 and 1985 — excluding the costs of the General Assembly (Lyon 1985) — approved by the Council at Lyngby was US$222 000. The Divisions requested US$201 175 and the estimates for the Standing Committees came to US$161 460. Faced with these problems, the Officers at their meeting in Oxford, 28–29 November 1983, decided to protect the scientific work of the Divisions as much as possible by funding the Divisions to the extent of 70% of their requests, viz. US$140 000 and the Standing Committees by only 50%. This necessarily involves some rather heavy cuts for the Standing Committees. It was fairly obvious that, with a budget of only US$82 000, some Standing Committees would not be able to meet. The estimates for the Bureau Meeting in 1984 and for two Executive Committee meetings in 1984 and 1985 were US$39 000 and US$30 400 respectively. Even with quite savage cuts to the other Standing Committees it soon became obvious to us that either the Bureau meeting or the two Executive Committee meetings would have to be abandoned. It was decided that the cuts should be made right at the top, i.e. there will be no Executive Committee meetings in Spring 1984 and 1985. Instead a sum of $5000 was allocated for two essential meetings of the Officers. No provision was made for the CHEMRAWN Committee which will, I hope, find funds from within its own resources for its 1984 meeting or for the Committee on Chemistry and Industry (COCI). In addition, the Editorial Board of *Chemistry International,* which had requested a meeting in 1984, and the Committee on Maximization of Participation of Chemists in IUPAC's Affairs (COMPAC) will have to act by correspondence.

Whilst, therefore, a very hard time lies ahead for many of the Standing Committees during the next biennium, all of them should be able to meet and take stock of the new situation at the Assembly in Lyon, Summer 1985. By judicious use of cheap travel facilities and meeting in low-cost venues, and/or at off-peak times, it is envisaged that the work of the Commissions in the inter-Assembly year of 1984 will be able to proceed, even if with some difficulty.

## (IV) Maintains its Divisional activity —

The funds allocated to Divisions I, II, III, IV, V, VI and VII are US$K 18, 21, 22, 16, 24, 24 and 15, respectively. Each Division President has been notified of the allocation for his/her Division and has, in turn, to make allocations for each Commission. We hope that all Titular Members of Commissions will seek cheap travel arrangements and endeavour to request less than the set subsistence level.

## (V) And hopes for Affiliation

You may remember from my previous Column (CI, 1983, No. 6, pp. 2–10) that I promised to let you know this year of the Officers' decisions regarding what could, or might be, done about the future of the Affiliate Membership Scheme; see CI, 1983, No. 4, pp. 17–21. At Lyngby, Council approved the introduction of the Scheme, but in the budget vote subsequently decided that it could not afford to absorb the staff costs for 1984 and 1985 to set up the

**The Officers of the Union, Dr. Schneider, Prof. West, Prof. Rao and Prof. Björkman, debate the allocation of funds.**

Scheme. Having taken stock of the gloomy financial prospects within the 1984–1985 biennium the Officers decided at their recent meeting to try to secure sufficient funding from outside bodies to provide the necessary money to launch a recruiting drive in 1985, with effective membership beginning on 1 January 1986. I should perhaps add here, for those who think that this is slow, that the complex nature of discussions with NAOs, national Chemical Societies and non-IUPAC countries — which can only begin after funds have been secured from outside IUPAC — necessarily make this a very slow process in most instances.

The International Committee of one Chemical Society of a member country of IUPAC has already offered to start raising funds and we hope that others will also help. Another member country had indicated (notionally) at the Assembly that it might ‘sponsor’ some chemists from developing countries to become Affiliates if the Scheme comes into being. Meanwhile, we ourselves have petitioned for funding from ICSU to enrol about 200 chemists from developing countries, contingent on our being able collect the necessary funds to set the Scheme in motion in 1985.

Much hard work lies ahead. We can but hope for a successful outcome for our appeals and hope that those within the Union who can help or advise us will do so — urgently.

## A FINAL NOTE

Dr. W. Schneider, President of the International Union of Pure and Applied Chemistry, popped over from Canada for the budget meeting of his vast organization, whose Secretariat is in Oxford.

One of the union’s 35 international committees has a project dealing with mycotoxins, which are traces of highly poisonous chemicals in natural systems.

Dr Schneider had to conduct his budget discussions for this committee, among others, from his sickbed. He ate some seafood, a well-known source of mycotoxins — and went down with food poisoning. Which goes to show how very necessary his committee’s research is!

(*reproduced by permission from the* Oxford Mail, 5 *December* 1983).

---

# IUPAC PUBLICATIONS

## Solubility Data Series, Vol. 12. Sulfur Dioxide, Chlorine, Fluorine and Chlorine Oxides

The xvii + 477-page volume devotes 332 pages to sulfur dioxide systems, 113 pages to chlorine systems, one page to the fluorine + hydrogen fluoride system, five pages to chlorine monoxide + water and three pages to chlorine dioxide + water systems.

The volume contains compilations of the experimental solubility data of the title gases as reported in the scientific literature. Smoothed recommended values of the mole fraction solubility of sulfur dioxide and of chlorine in water are given. Tentative smoothed values of mole fraction solubility of chlorine oxides in water are given.

In addition to the solubility values in water, there are sections on the solubility of sulfur dioxide in sea water, aqueous electrolyte and aqueous organic solutions, alkanes, arenes and other hydrocarbons, alcohols and other organic solvents containing oxygen, nitrogen or hydrogen. Also sections on chlorine solubility in aqueous electrolyte solutions, alkanes and other hydrocarbons and organic solvents containing oxygen, nitrogen or halogen. Evaluations containing recommended or tentative mole fraction solubility values are a part of many of the sections.

Edited by C. L. Young the hardcover volume cites over 250 authors of solubility data. It is available from Pergamon Press, price US$100. ISBN 0 08 026218 X.

# IUPAC PEOPLE

**We congratulate:**

**Prof. V. A. Fassel** (former Secretary and Chairman, Commission V.4) on being the 1983 winner of the AOAC Harvey H. Willard Award, given for his work on induction-coupled plasma spectrometry and his contributions to the theory of atomic spectral analysis.

**Prof. A. J. Bard** (Commission I.3) on the award of the 1984 Bruno Breyer Memorial Medal. Prof. Bard will deliver the Memorial Lecture at the 6th Australian Electrochemistry Conference to be held at Deakin University, Geelong, 19–24 February 1984.

**Prof. C. J. H. Schutte** (Commission I.5) on his re-election as President of the South African Chemical Institute for a second term of office.

We have seen that **Dr. L. A. K. Staveley** (former Chairman, Commission I.4 and responsible for the IUPAC book *Characterization of Chemical Purity of Organic Compounds,* Butterworths, 1971) retired from academic life in September 1982. The proceedings of the Lionel Staveley Retirement Meeting, held in Oxford, June 1982, were published (in English) in Vol. 25, issue 2 of *Revista Portuguesa de Quimica.*

# The International Commission on Atomic Weights – An Early Historical Review

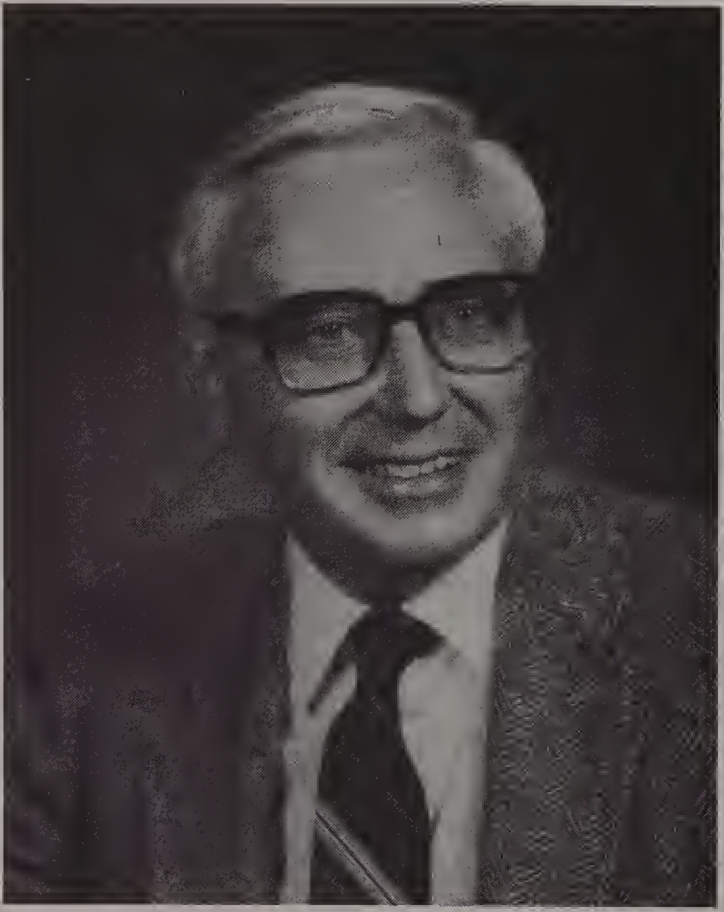
by Dr. N. E. Holden
Commission II.1

## PRE HISTORY

Speculation on the ultimate form of matter has engaged philosophers from earliest times. In the Ionian culture of Greece, Leukippos, Demokritos, and Epikuros philosophized about the atom.[1] However, by the 17th century, Greek atomism had taken on the connotation of atheism to the English clergy[2] and Newton rarely used the term 'atom', although his work was rooted in an atomistic theory of matter.[3] John Dalton is usually given credit for the first clear statement of atomic theory and for proceeding to establish it on a thoroughly sound experimental basis. An inquiry into the relative weights of the ultimate particles of matter was an entirely new subject with Dalton. In an attempt to explain the problem of the variation of gaseous solubilities discovered by William Henry and its effect on his own theory of mixed gases, Dalton compared the relative weights of the ultimate particles of bodies.[4] The originality of Dalton's work was his calculating system to compare the weights of chemical particles.[5] The first table of atomic weight values was given by him in a paper entitled, "On the Absorption of Gases by Water and Other Liquids." It was read to the Manchester Literary and Philosophical Society, of which Dalton was secretary, on 21 October 1803. (It might be noted that the Manchester Society was England's oldest continuing scientific society, other than the Royal Society of London.) Values given in the table indicate that Dalton grasped the idea of constant composition in compounds and of multiple proportions. His later tables in 1808 and 1810[6] show a marked improvement in accuracy but the values are still difficult to recognize because of errors in valency, i.e. some equivalent weights are quoted rather than atomic weights.

In an anonymous article in 1815,[7] William Prout (Oxford) proposed that elemental atomic weights were integral multiples of the hydrogen value. The rough estimates then available for atomic weight values lent apparent support to this idea.

Jons Jacob Berzelius, who discovered a number of chemical elements and developed the chemical notation and formula still presently used (with slight modification), provided the first major improvement in measured atomic weight values. Beginning in 1810,[8] Berzelius published a series of articles on atomic weight measurements in which he reported actual weighings along with results of other chemists on an oxygen (O = 100) scale. The results of Berzelius' analyses tended to disprove Prout's hypothesis on integral relations among the elements, e.g. carbon/hydrogen: 76.438/6.25 = 12.23 (where O = 100).



**Dr. Norman E. Holden, Chairman, Commission II.1, 1979–1983.**

The Belgian chemist from Leuven, Jean Servais Stas, studied under Jean Dumas in Paris. Dumas believed in Prout's hypothesis and doubted Berzelius' results. With Dumas, Stas obtained a value for carbon of 75.02 based on O = 100.[9] With H = 1, oxygen was approximately 16, and carbon would be 12.0, so that Prout's hypothesis might still have validity within experimental error.

Stas measured atomic weights for a number of elements which Dumas thought supported Prout's hypothesis, i.e. nitrogen, chlorine, sulfur, sodium, potassium, silver and lead, in a series of experiments finally published in 1860.[10] Stas proved that atomic weight values were not multiples of hydrogen, one-half hydrogen or even one-quarter of the hydrogen values (as maintained by Dumas).

Following Stas' first paper, he redetermined the atomic weights even more carefully in 1865,[11] after Marignac[12] had cast doubt on the law of constant proportion and on the possibility of obtaining chemically pure substances. In spite of all the atomic weight determinations that were being performed, Dalton's atomic theory did not gain widespread acceptance. The French chemist, C. L. Berthollet immediately critically attacked Dalton.[13] As late as the 1870s, scientists used the calculational system while scorning the underlying theory.[14]

## ATOMIC WEIGHT COMMISSIONS

In addition to the measurements quoted above, a large number of individuals were contributing results on atomic weight values. Frank W. Clarke (Cincinnati), who was chairman of the chemistry section of the American Association for the Advancement of Science (AAAS), presented his first evaluation of atomic weights at the AAAS meeting in August 1879[15] and in 1882 published his recalculation of the atomic weights.[16]

The atomic weight had taken on the concept of a constant of nature like the speed of light. With so many different values being reported, the American Chemical Society (ACS), in 1892, appointed a permanent committee to report on a standard table of atomic weights for acceptance by the Society.[17] Clarke, who was now chief chemist for the U.S. Geological Survey, was appointed a committee of one to provide the report. Clarke, who later was elected ACS president, presented his first report at the 1893 annual meeting[18] and published it in January 1894.[19] He continued as a one-man committee for the Society until he asked to be relieved of the responsibility in March 1913[20] and Gregory P. Baxter (Harvard) was appointed to replace him.

In 1897, the Deutsche Chemische Gesellschaft appointed a three-man committee to report on atomic weights. The committee consisted of Hans Landolt (Berlin), who produced the physical-chemical tables with Richard Börnstein, Wilhelm Ostwald (Leipzig), who later won a Nobel Prize in Chemistry for catalysis, and Karl Seubert (Hannover), who had published the atomic weights of the elements[21] when working for Lothar Meyer at Tübingen. This committee published its first report in 1898.[22] In contrast to Clarke, who presented a review of every atomic weight value published during the year along with his recommended values, the German committee merely gave the table with its estimates of the best value for each element. In addition to the table of values, they suggested the desirability of an international committee for atomic weights and they argued for the adoption of the O = 16 scale.

Landolt, Ostwald and Seubert issued an invitation on 30 March 1899 to other organizations having an interest in chemistry to appoint delegates to the international body.[23] The Committee initially formed had 57 chemists.

**Frank W. Clarke—Leading vote getter for the first International Commission. Served from 1900–1923.**

This international committee's first report, for 1901, was a table on the O = 16 scale, which appeared as a flyleaf in issue 1 of the Chemische Berichte for 1902.[24] The committee's conferences were conducted by correspondence. The German committee asked the international committee members to elect a smaller committee of three members to avoid the difficulties and delays associated with the larger committee.[25] They also asked for a vote on an O = 16 scale, H = 1 scale or both. Sixteen votes were cast for the smaller committee and the results are shown in Table 1. The top three names, Clarke, Seubert, and Thomas Edward Thorpe (London) were elected.[26] Thorpe had been the first professor of chemistry at Leeds (then called Yorkshire College of Science) and was now Director of the Government Laboratories and responsible for their design and equipment.

This smaller committee published its first report, for 1902, in January 1903.[27]

Table 1. Membership on the International Committee

| Nominee | Country | Votes |
|---|---|---|
| F. W. Clarke | USA | 11 |
| T. E. Thorpe | England | 9 |
| K. Seubert | Germany | 8 |
| T. W. Richards | USA | 7 |
| W. Ostwald | Germany | 5 |
| H. Landolt | Germany | 4 |
| A. Scott | England | 3 |
| C. Winkler | Germany | 3 |
| W. Crookes | England | 2 |
| R. Meldola | England | 2 |
| H. Moissan | France | 1 |
| E. W. Morley | USA | 1 |

The only Frenchman to receive a vote was Henri Moissan (Sorbonne), who was to win a Nobel Prize for the isolation of fluorine and development of the high temperature furnace. (It is interesting to note that Moissan constructed his famous electric furnace in an attempt to produce artificial diamonds and thought he had succeeded.[28] This has since been shown to be incorrect.[29]) Moissan was appointed as a French representative on the Committee in 1903.[30]

When Seubert resigned from the Committee in 1906, Ostwald, who was the next highest German in the original vote, was appointed.[31] When Moissan died in 1907, George Urbain (Sorbonne), who discovered lutetium in ytterbium samples in 1908,[32] replaced him. Urbain served as a link with the reorganized committee after World War I.

This Committee reported annually to 1921, except for 1918 (due to the War). The War ended correspondence with Ostwald in 1916[33] which, because of wartime hostilities, was never resumed.[34]* The Germans considered this Committee as no longer international in scope[35] and formed their own committee with Ostwald as their initial chairman.[36]

## INTERNATIONAL AFFILIATION

The International Association of Chemical Societies was formed in Paris on 25 April 1911. At the Berlin meeting in April 1912, Prof. Ostwald, who was the Association President at the time, stated that the International Committee on Atomic Weights wished to join the International Association. The International Committee was asked to provide its organizational statute for the next meeting and was formally affiliated with the Association at the Brussels meeting on 19 September 1913.[38]

The International Association of Chemical Societies dissolved during the War, but the International Committee continued to publish their tables until their final report for 1921–1922.[39]

The Inter-allied Chemical Conference was held in London, 14–18 July 1919 where the Chemical Societies of Belgium, England, France, Italy and the United States framed the constitution of the International Union of Pure and Applied Chemistry (IUPAC) as the Chemical Section of the International Research Council with autonomous powers.† The Conference continued in Brussels on 22 July in connection with the International Research Council, where final adoption of the statutes of IUPAC was made.

The next session of the International Chemical Conference was held in Rome, 21–25 June 1920 where the IUPAC Council met and established an International Committee on Atomic Weights and requested the old committee of Clarke, Thorpe and Urbain to continue their work. It is interesting to note that two proposals were made for consideration at the following year's meeting: first, atomic weight values should ony be revised every 10 years and second, that Dalton's proposal of H ≡ 1 be readopted as the standard for the atomic weight system.

---

*e.g. on 9 September 1918 Ostwald, who had been unanimously elected an honorary member of the ACS on 26 June 1900, was formally expelled by a resolution made effective back to 1 August 1914.[37]

†The International Research Council was replaced in 1931 by the International Council of Scientific Unions (ICSU). This international non-governmental scientific organization is composed of 20 international scientific unions, 66 national members, 17 scientific and 4 national associates. It is probably best known for initiating and coordinating the International Geophysical Year.

The Second International Conference of Pure and Applied Chemistry met at Brussels, 25–30 June 1921. Following a proposal presented by Philippe Guye (Geneva), the old committee on atomic weights was reorganized, enlarged and renamed the Committee on Chemical Elements. In addition to atomic weight values, the Committee was to cover the discovery of isotopes in radioactive and non-radioactive elements. Tables of radioactive elements and their principal constants, a table of isotopes, and a table of atomic weights were to be prepared. Clarke and Thorpe, both in their late seventies, were appointed honorary presidents and Urbain presided over the new committee. Other members appointed to the new committee included Francis Aston (Cambridge), the Nobel Prize winner for the discovery of a large number of non-radioactive isotopes, Bohuslav Brauner (Charles University, Prague) who became president of the subcommittee on atomic weights, Andre Debierne (Paris) who was a student of Marie Curie and was credited as the discoverer* of actinium,[40] Philippe Guye, Theodore Richards (Harvard), a Nobel Prize winner for his atomic weight work, and Fredrick Soddy (Oxford), a Nobel Prize winner for the investigation of the origin and nature of isotopes.

After the third IUPAC conference in Lyons, France in 1922, the Committee on Chemical Elements met in Paris on 13 July and, in consequence of the death of Guye, elected Gregory Baxter and Anatole Leduc (Sorbonne) as additional members. They voted to publish the table of isotopes and of radioactive elements in 1923,[42] and to continue the old committee's table of 1922, if a new general table of atomic weights could not be completed in time. This Committee published a completely revised atomic weight table in 1925,[43] but did not revise the table again before it was reorganized after 1930.

In 1923, the Committee on Chemical Elements urged all national members of IUPAC to create national committees to work with this International Committee. As noted above, the Germans had previously done this and were reporting annually and the Swiss, Spanish and English followed suit but they only produced one report each.

In 1930, the Committee on Chemical Elements was reorganized into three committees, on atomic weights, atoms and radioactive constants. Baxter became president of the Atomic Weights Committee and was joined by Marie Curie (Paris) Nobel Prize winner in both physics and chemistry, Paul LeBeau (Paris) who had been a student of Moissan, Richard J. Meyer (Berlin) who had been a member of the German committee since 1921, and Otto Hönigschmid (Munich), a former student of Richards and chairman of the German committee after Ostwald retired. The national committees were asked to cease publishing reports and the new committee produced its first report in 1931.[44] Following Curie's death and the retirement of Meyer and LeBeau, Marcel Guichard (Paris) and Robert Whytlaw-Gray (Leeds) were appointed in 1938. The Committee was reorganized once again in 1949, following Baxter's retirement and Hönigschmid's death.

**Francis Aston — Nobel Prize Winner — Member of the Committee on the Chemical Elements from 1921–1930.**

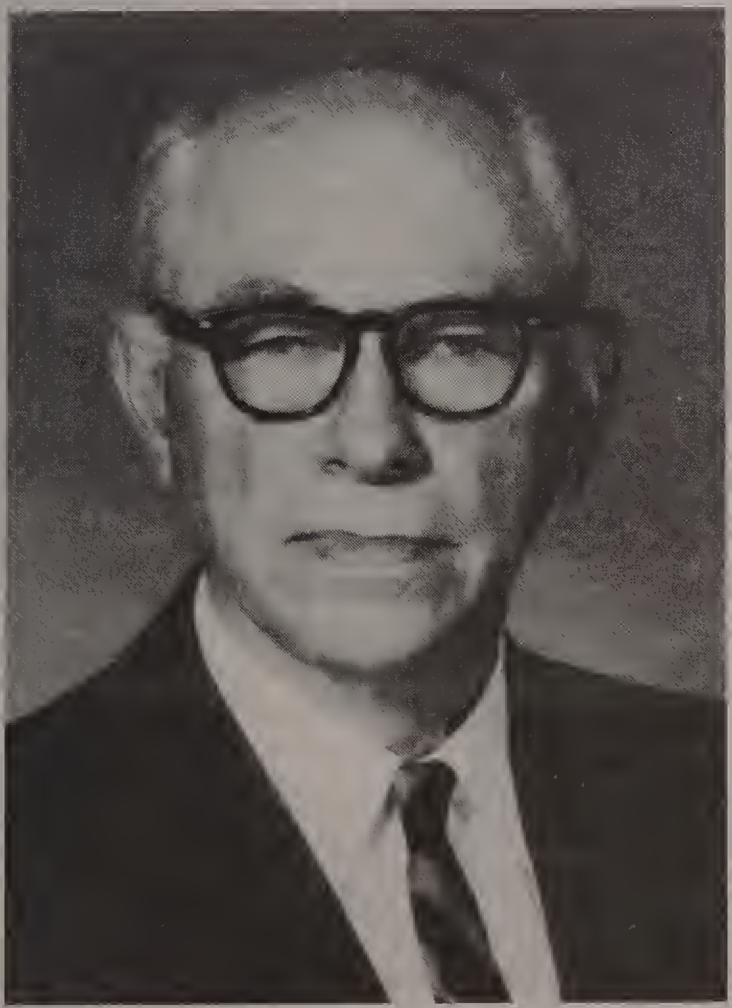
Since the only remaining members, Whytlaw-Gray, who was retiring to Coventry, and Guichard, who in fact never participated again, were in their seventies, Edward Wichers of the National Bureau of Standards (NBS) was asked to assume the presidency and reactivate the Commission. With the emphasis on physical rather than chemical determinations, the modern era with a large committee began. Mass spectrometry experts were added such as Alfred Nier (Minnesota) who singlehandedly revised all the physical determinations for the 1955 table, Josef Mattauch (Munich) who convinced the world of physicists to switch to the $^{12}C = 12$ mass scale, and A. E. (Gus) Cameron (Oak Ridge) who revised the physical measurements to the $^{12}C$ standard for the 1961 table.

---

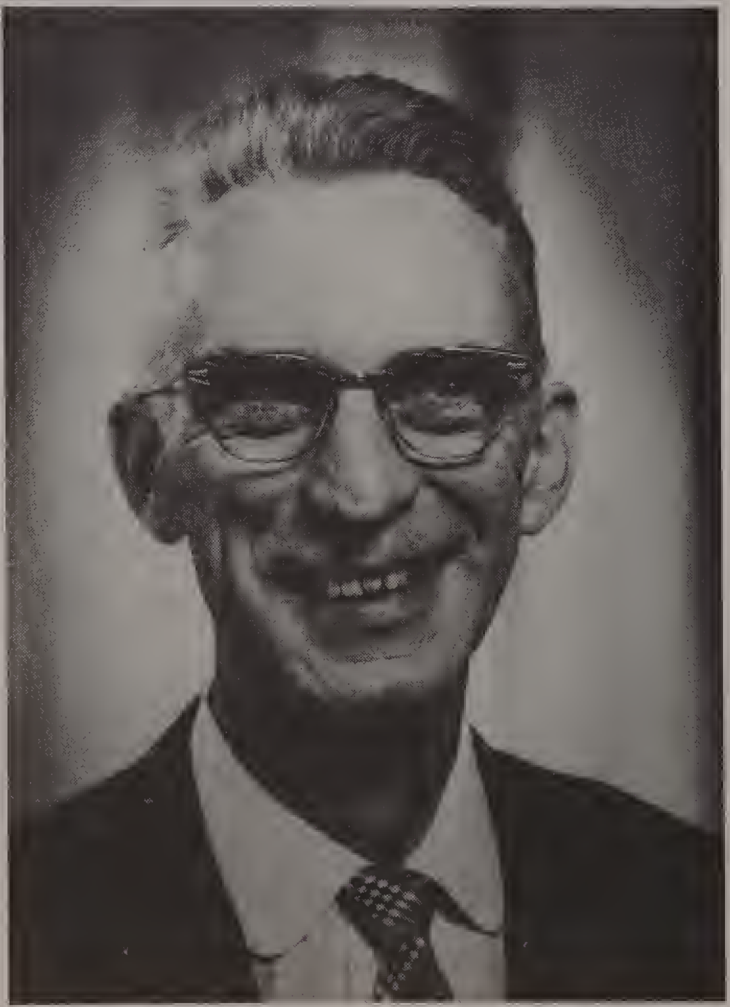
*Debierne's claim to discovery of actinium appears doubtful considering the critical reevaluation by Kirby.[41] Debierne's major contribution appears to be the name 'actinium'.

Otto Honigschmid — Student of Richards and the "Harvard Method" of equivalent point chemistry determination of atomic weights. Chairman of the German Committee during 1920's and member of the International Commission 1930-1945.

Alfred Nier — Elected to Commission after World War II in recognition of the growing importance of physical determinations of atomic weights. First proposed $^{12}C$ mass scale to resolve the discrepancy between the physical and chemical mass scales.



Edward Wichers — Chairman of the Commission 1949–1969, except for a short interval. Convinced chemists to switch to $^{12}C$ mass scale.



A. E. (Gus) Cameron — Member of the Commission 1959--1981. Recalculated the atomic weights to the $^{12}C$ mass scale in the 1961 "Cameron–Wichers" Report.

## THE ATOMIC WEIGHT SCALE

The atomic weight scale H = 1 was originally used by Dalton and (except for Berzelius' time) had been used for approximately 100 years when the ACS and German committees began reporting tables. Lothar Meyer and Seubert had published on the hydrogen scale,[21] but Ostwald and Brauner[45] strongly urged the adoption of O = 16 as standard. Clarke reported his table on both scales, while the German committee used O = 16 exclusively and argued for its adoption. In October 1899, the German committee asked the international delegates if O = 16 should be fixed as the future standard and of 49 replies, 40 favored oxygen, only seven favored hydrogen with two accepting either or both.[23] As a result, the first international table was published on the O = 16 scale.[24] A vigorous protest against the decision was made by university chemistry teachers in Germany and the committee for the decennial revision of the United States Pharmacopoeia among others, who preferred the H = 1 standard. As a result, the smaller international committee continued publishing the annual tables on both scales until a consensus could be reached. This practice brought a reply in strong opposition from Ostwald.[46]

The proponents for the H = 1 scale argued that it had the advantage of being Dalton's standard and it was the most natural basis for atomic weights because hydrogen is the lightest atom known and it was the standard for gaseous densities. In addition, teachers argued that it is easily intelligible to beginners, whereas the oxygen standard was difficult to explain.

The proponents of the oxygen scale argued that oxygen was the experimental standard reference. Every atomic weight was related to oxygen either directly or indirectly. Hydrogen was only a nominal unit with the actual determination of atomic weight referred to hydrogen through the ratio H:O. Everytime this fundamental base ratio, H:O, is redetermined (see e.g., William Noyes' contribution[47]), the entire table must be changed. Thus, apparent historical conservatism implies wide-spread and radical change. It thus became a question of the teacher (theory) vs the laboratory chemist (practice).

Beginning with the 1906 report, the International Committee used the 0 = 16 scale following the new survey of the larger committee. The final count was 31 votes for 0 = 16, two votes for H = 1, nine votes for both scales and 17 abstaining. Thus, the scale was settled for some 30 years except for a brief discussion in 1920 on going back to the hydrogen scale.

In 1929, the discovery of oxygen isotopes by Giauque and Johnston[48] led to a situation in which the chemists' scale of O = 16 differed from the physicists' scale $^{16}O = 16$. When Dole[49] reported the variation in oxygen's atomic weight in water vs air, this implied a variation in the isotopic composition of oxygen and the two scales took on a small but variable difference. The Commission briefly discussed the atomic weight standard in their 1932 report[50] where they considered $^{1}H \equiv 1$, $^{4}He \equiv 4$, $^{16}O \equiv 16$, and O = 16 before choosing to follow Aston, who argued that the two scales satisfied everyone's requirements.

The variable scale difference was of great concern to Wichers and for a number of years he attempted to have the Commission fix the scales' difference by definition. This would effectively define the isotopic composition of oxygen to be a particular value in nature. Failing this solution, he solicited proposals for an alternative scale which would be acceptable to both the physics community as well as to chemists. In April 1957 at a hotel bar in Amsterdam, Nier suggested to Mattauch that the $^{12}C = 12$ scale be adopted because of carbon's use as a secondary standard in mass spectrometry.[51] $^{12}C = 12$ implied acceptable changes in the atomic weight scale, i.e. 42 parts per million (ppm) compared to the 275 ppm for $^{16}O = 16$ scale (which was not

**Josef Mattauch — Member of the Commission during the 1950's, he led the effort to convince physicists to accept the $^{12}C$ mass scale.**

acceptable to chemists). Enthusiastically, Mattauch† made a worldwide effort in the late 1950s to publicize the $^{12}$C scale and obtain physicists' approval, while Wichers obtained the chemists' approval. In 1961, the atomic weights were officially given on the $^{12}C = 12$ scale for the first time.[52]

## EPILOGUE

The atomic weight standard has finally been settled after 160 years. The Commission has expanded its purview to incorporate the isotopic composition of the elements, with a corresponding name change. However, the job of fixing atomic weight values continues unabated to provide the chemical community with internationally accepted values for trade, commerce and classroom requirements.

---

†Mattauch was so anxious to tell the world of Nier's suggestion of the $^{12}$C mass scale as the resolution of the atomic weight dispute between chemists and physicists that he rushed off to the Paris IUPAC General Assembly without his passport. He had to spend the night at Trier (on the German–French border) waiting for Nier to retrieve the passport back at the Max Planck Institute in Mainz before he could continue on to the Commission meeting and unveil the solution.

## REFERENCES

1. D. H. D. Roller (1981) Greek atomic theory. *Am. J. Phys.*, **49**, 206.
2. R. Kargon (1964) Walter Charleton, Robert Boyle, and the acceptance of epicurean atomism in England. *Isis*, **55**, **184**.
3. R. E. Schofield (1981) Atomism from Newton to Dalton. *Am. J. Phys.*, **49**, **211**.
4. J. Dalton (1805) *Mem. Proc. Manchr. lit. phil. Soc.*, **1**, 271.
5. T. Thompson (1807) *A System of Chemistry*, 3rd ed., Vol. 3, p. 424, Edinburgh.
6. J. Dalton, *New System of Chemical Philosophy* (London, Pt. 1, 1808; Pt. II, 1810; Vol. II, Pt. 1, 1827; 2nd ed., Pt. I, 1842).
7. Anonymous (attributed to W. Prout), On the relation between the specific gravities of bodies in their gaseous state and the weights of their atoms. *T. Thompson's Annals of Philosophy*, **6**, 321 (1815); Corrections of a mistake in the essay on the relationship between the specific gravities of bodies in their gaseous states and the weights of their atoms. *Ibid.*, **7**, 111 (1816).
8. W. Hisinger and J. J. Berzelius (1810) Forsok rorande de bestamda proportioner, hvari den oorganiska naturens bestandsdelar finnas forenada. *Afh. Fys., Kemi Mineral.* **3**, 162.
9. J. Dumas and J. S. Stas (1840) Recherches sur le veritable poid atomique du carbone. *Compt. Rend.*, **11**, 991.
10. J. S. Stas (1860) Recherches sur les rapports reciproques des poids atomiques. *Bull. Acad. r. Belg.*, **10**, 208.
11. J. S. Stas (1865) Nouvelles recherches sur les lois des proportions chimiques, sur les poids atomiques et leurs rapports mutuels. *Mém. Acad. r. Belg.*, **35**, 3.
12. J. Marignac (1860) *Archs. Sci. phys. nat.*, **9**, 105.
13. C. L. Berthollet (1803) *Essai de statique chimique*, 2 Vols., Paris.
14. W. H. Brock and D. M. Knight (1965) The atomic debates: Memorable and interesting evenings in the life of the Chemical Society. *Isis*, **56**, 5.
15. A preliminary notice of a revision of the atomic weights. *Am. Chem. J.*, **1**, 295 (1879).
16. F. W. Clark (1882) The constants of nature, Pt. 5 — Recalculation of the atomic weights, Smithsonian Miscellaneous Publications No. 441, Washington, D.C.
17. Proceedings, Pittsburgh Meeting. *J. Am. Chem. Soc.*, **15**, 328 (1893).
18. The Baltimore Meeting. *J. Am. Chem. Soc.*, **16**, 73 (1894).
19. F. W. Clarke (1894) Report of Committee on Determinations of Atomic Weight, published during 1893. *J. Am. Chem. Soc.*, **16**, 179.
20. Proceedings, General Meeting (Milwaukee). *J. Am. Chem. Soc.*, **35**, 61 (1913).
21. L. Meyer and K. Seubert (1883) Die Atomgewichte der Elemente aus den Originalzahlen neu berechnet, Leipzig.
22. H. Landolt, W. Ostwald and K. Seubert (1898) *Ber. dt. chem. Ges.*, **31**, 2761.
23. H. Landolt, W. Ostwald and K. Seubert (1900) Zweiter Bericht der Commission fur die Festsetzung der Atomgewichte. *Ber. dt. chem. Ges.*, **33**, 1847.
24. 1902 Internationale Atomgewichte. *Ber. dt. chem. Ges.* **35** (1902).
25. H. Landolt, W. Ostwald and K. Seubert (1901) Dritter Bericht der Commission fur die Festsetzung der Atomgewichte. *Ber. dt. chem. Ges.*, **34**, 4353.
26. H. Landolt, W. Ostwald and K. Seubert (1901) Vierter Bericht der Commission fur die Fetsetzung der Atomgewichte. *Ber. dt. chem. Ges.*, **35**, 4028.
27. F. W. Clarke, T. E. Thorpe and K. Seubert (1903) Report of the International Committee on Atomic Weights. *J. Am. Chem. Soc.*, **25**.
28. H. Moissan (1894) Nouvelles experience sur la reproduction du diamant. *Ct. r. Acad. Sci., Paris*, **118**, 320; H. Moissan (1895) Sur quelques experiences nouvelles relatives a la preparation du diamant. *C. r. Acad. Sci., Paris*, **123**, 206; and H. Moissan (1895) Etude du diamant nour. *C. r. Acad. Sci., Paris*, **123**, 210.
29. F. P. Bundy *et al.*, (1955) Man-made diamonds. *Nature, Lond.*, **176**, 51.
30. F. W. Clarke, T. E. Thorpe, K. Seubert and H. Moissan (1904) Report of the International Committee on Atomic Weights. *J. Am. Chem. Soc.*, **26**, 1.
31. H. Landolt, W. Ostwald and O. Wallach (1906) Siebenter Bericht der Commission fur die Festsetzung der Atomgewichte. *Ber. dt. chem. Ges.*, **39**, 2176.
32. G. Urbain (1908) Un nouvel element: le lutecium, resultant du dé doublement de l'ytterbium de Marignac. *C. r. Acad. Sci., Paris*, **145**, 759.
33. F. W. Clark, T. E. Thorpe and G. Urbain (1916) Annual Report of the International Committee on Atomic Weights, 1917. *J. Am. Chem. Soc.*, **38**, 2219.
34. F. W. Clark, T. E. Thorpe and G. Urbain (1919) Report of the International Committee on Atomic Weights for 1919–20. *J. Am. Chem. Soc.*, **41**, 1881.
35. R. J. Meyer (1922) Atomgewichtsfragen. *Naturwissenschaften*, **42**, 911.

36. M. Bodenstein *et al.* (1921) Atomgewichtstabellen fur das Jahr 1921. *Ber. dt. chem. Ges.*, **54**, 181.
37. Proceedings, Cleveland Meeting. *J. Am. Chem. Soc.*, **40**, 95 (1918).
38. F. W. Clarke, T. E. Thorpe, W. Ostwald and G. Urbain (1914) Annual Report of the International Committee on Atomic Weights, 1915. *J. Am. Chem. Soc.*, **36**, 1585.
39. F. W. Clarke, T. E. Thorpe and G. Urbain (1921) Report of the International Committee on Atomic Weights for 1921–22. *J. Am. Chem. Soc.*, **43**, 1751.
40. A. Debierne (1899) Sur une nouvelle matiere radio-active. *C. r. Acad. Sci., Paris*, **129**, 593.
41. H. W. Kirby (1971) The discovery of actinium. *Isis*, **62**, 290.
42. F. W. Aston *et al.* (1923) Report of the International Committee on Chemical Elements — 1923. *J. Am. Chem. Soc.*, **45**, 867.
43. F. W. Aston *et al.* (1925) International Atomic Weights — 1925. *J. Am. Chem. Soc.*, **47**, 597.
44. G. P. Baxter *et al.* (1931) First Report of the Committee on Atomic Weights of the International Union of Chemistry. *J. Am. Chem. Soc.*, **53**, 1627.
45. B. Brauner (1888) The Standard of Atomic Weights. *Chem. News* **58**, 307 and B. Brauner (1889) Die Basis det Atomgewichte. *Ber. dt. chem. Ges.*, **22**, 1186.
46. W. Ostwald (1903) Bericht det internationalen Atomgewichts. Kommission nebst Bemerkungen von W. Ostwald. *Ber. dt. chem. Ges.*, **36**, 634.
47. W. Noyes (1907) The atomic weight of hydrogen. *J. Am. Chem. Soc.*, **29**, 1718.
48. W. F. Giaugue and H. L. Johnston (1929) An isotope of oxygen of mass 17 in the earth's atmosphere. *Nature, Lond.*, **123**, 831 and *J. Am. Chem. Soc.*, **51**, 3528.
49. M. Dole (1935) The relative atomic weight of oxygen in water and in air. *J. Am. Chem. Soc.*, **57**, 2731.
50. G. P. Baxter *et al.*, (1932) Second Report of the Committee on Atomic Weights of the International Union of Chemistry. *J. Am. Chem. Soc.*, **54**, 1269.
51. J. Mattauch (1958) The rational choice of a unified scale for atomic weights and nuclidic masses supplement to E. Wichers, Report on atomic weights for 1956–1957. *J. Am. Chem. Soc.*, **80**, 4121.
52. A. E. Cameron and E. Wichers (1962) Report of the International Commission on Atomic Weights (1961). *J. Am. Chem. Soc.*, **84**, 4175.

# LETTERS TO THE EDITOR

*You may remember that we recently published a letter drawing attention to the problems of nomenclature of polymeric materials. A reply from Prof. A. D. Jenkins, Chairman of Commission IV.1, is reproduced below. Further correspondence on this, or any other matter of IUPAC concern, would be welcomed.*

In his letter to *Chemistry International* (CI, 1983, No. 5, p. 49), Dr. Feuerberg rightly draws attention to the problems created when several different bodies each devise their own system of nomenclature or abbreviations for materials such as polymers. As he says, IUPAC Commission IV.1 produced a set of Basic Definitions of Terms Relating to Polymers in 1974, together with a list of Standard Abbreviations for 17 polymers of particular importance at that time. In the limited time available to the Commission (one meeting each year) it has been necessary to give priority to the difficult but vital task of developing nomenclature for polymers: the Commission has produced recommendations for single-strand organic polymers, for single-strand inorganic and coordination polymers, for copolymers, and for the stereochemistry of polymers, as well as a general classification system for polymers. It is true, as he says, that the nomenclature may sometimes seem complicated but this inevitably reflects the complex structures that polymers often have, and one must realise that the Commission has not yet tackled the more elaborate cases that can readily be visualized.

Despite the pressure of its mainstream activities, Commission IV.1 took the decision at the 1983 General Assembly at Lyngby to set up a Working Party, under the chairmanship of Prof. Dietrich Braun, to consider "current practice in the use of abbreviations (for polymers) and to make recommendations for possible action". It will be necessary to collect together as many as possible of the systems of abbreviation used by the various interested parties and to consider the recommendations: almost certainly, arbitrary choice will be involved in some cases.

This would be a particularly useful time for anyone who is interested in this problem to send constructive suggestions for making progress with an agreed set of abbreviations but it has to be realized that there is no way of enforcing implementation of IUPAC recommendations after they have been published. An important step forward would be made if the editors of scientific, technological and commercial journals concerned with plastics would insist on the use of IUPAC symbols and nomenclature in their publications; this is perhaps the best hope for the universal adoption of IUPAC recommendations, leading to the general use of a single system which Dr. Feuerberg would like to see.

**A. D. Jenkins**

# OTHER PEOPLE'S PUBLICATIONS

## European Federation of Biotechnology (EFB)

**EFB Newsletter No. 6, September 1983.** Editorial calling for more coordinated work and less uncoordinated talk. Conclusions from the Joint Meeting of the Science Advisory and Executive Committee and Working Party Chairman (March 1983): reports on Working Parties on — Applied Molecular Genetics, Downstream Processing and Recovery Bioproducts, Environmental Biotechnology, Education in Biotechnology, Immobilized Biocatalysts, Mass Cell Culture Technology, Safety in Biotechnology, Standard Methods for Evaluation of Bioreactors and Bioreactor Standards, Applied Microbial Physiology. List of laboratories and institutions in Spain and GDR active in biotechnology. Article on Biotechnology and the European Community.

## Federation of Asian Chemical Societies (FACS)

**FACS Newsletter No. 2, August 1983.** Highlights of FACS biennial General Assembly, Baghdad; the South Asia Cooperative Environment Programme; environmental challenges being faced by the five ASEAN countries (Indonesia, Malaysia, Philippines, Singapore and Thailand); projects of the Working Group on Chemistry and Environment; announcements of PAC CHEM '84 — see CI, 1983, No. 6, p.13 — (Honolulu, Hawaii, USA, 16–21 December 1984), Asian Chemical Conference on 'Priorities in Chemistry in Development of Asia' (Kuala Lumpur, Malaysia, 29–31 March 1984), International Conference on 'Analytical Chemistry in Development' (Colombo, Sri Lanka, 21–24 August 1984).

## Groupement pour l'Avancement des Methodes Spectroscopiques et Physicochimiques d'Analyse (GAMS)

**GAMS Information Bulletin No. 81, September and October 1983.** Editorial on 23rd Colloquium Spectroscopicum Internationale, June/July 1983; details of meetings in October 1983 and of the 35th GAMS Congress and 3rd Congress of Analytical Chemistry, December 1983.

## International Council of Scientific Unions (ICSU)

**ICSU Newsletter No. 15, September 1983.** Decisions of the Executive Board and report of the 17th meeting of the General Committee, Warsaw, August 1983. Reports of the Standing Committees on Free Circulation of Scientists and on the Safeguard of the Pursuit of Science. Report on the 4th meeting of CASAFA including the lists of seven first priority proposals for work. (Further details, and copies of the CASAFA Newsletter, are available from Dr. A. S. Johnson, CASAFA Secretariat, c/o IDRC, 60 Queen Street, P.O.B. 8500, Ottawa K1G 3H9, Canada.) Note on the *Ad hoc* Committee on Disposal of Toxic Wastes which will present a preliminary report to the ICSU General Assembly in September 1984. Article on the progress being made on, and future plans for, the ICSU Press. A summary of the findings of the Future Actions Committee of CHEMRAWN II. Article on the International Geographical Union (IGU).

## International Federation of Clinical Chemistry (IFCC)

**IFCC Newsletter No. 34, 1983/2.** Article on the members, working procedures and documents of the Expert Panel on Enzymes 1971–1982; the IFCC Annual Report for 1982; description of SRM 998, Angiotensin I (Human) and a standard method for expression of results of haemoglobin determination; brief report on the Expert Panel on Instrumentation; recent IFCC publications; report on symposium on 'Good Laboratory Practice Aided by Good Manufacturing Practices'.

## International Union of Pure and Applied Biophysics (IUPAB)

**IUPAB News, August 1983.** Calendar of meetings to December 1984. Report on a visit to Taiwan and People's Republic of China. Report of a lecture tour of India sponsored by the IUB/IUPAB/IUPAC Inter-Union Commission on Biothermodynamics.

# Laboratory Biosafety Manual

None of the large number of manuals, codes of practice, etc. on biosafety were entirely suitable for international application, so the World Health Organization, through its Special Programme on Safety Measures in Microbiology, has published this manual. It is in three main parts dealing, respectively, with: guidelines on basic standards of laboratory operation, design and equipment; procedures for safe laboratory practice; and the selection and use of essential biosafety equipment. Part I, 24 pages, deals with the basic laboratory, the containment laboratory, the maximum containment laboratory and the gene technology laboratory. Part II, 46 pages, has sections headed: Safety organization and management; Good laboratory practice; Rules of practice for support staff; Training programmes; Safe shipment of specimens and infectious substances; Contingency plans and emergency procedures; Disinfection and sterilization; General safety checklist; and Hazardous properties of laboratory chemicals. In Part III, 26 pages, the two topics of Equipment that may create a hazard and Safety equipment are dealt with. At the end there is, *inter alia,* a six-page bibliography. The Manual may be obtained from WHO Regional Offices or WHO Distribution and Sales Service, 1211 Geneva 27, Switzerland, price Sw.fr.14.

# SUMMARY MINUTES OF COMMITTEE AND COMMISSION MEETINGS

## **Analytical Chemistry Division Committee:** Lyngby, Denmark, 18 and 23 August 1983

All members of the Division Committee were present. The death on 29 June 1983 of Prof. Belcher, who had served the Division long and well for over 30 years was noted with much regret and a moment of silence was observed in his memory.

### Election of New Officers and Committee Members

The results of the 1983 election of members to the Division Committee for the term 1983–1987 were announced:

Profs. J. F. Coetzee, H. Freiser, G. G. Guilbault, Y. Marcus, J. Robin, and G. Tölg had been elected.

Prof. G. den Boef was selected as a co-opted member and elected Secretary for the period 1983–1985. Other co-opted members selected were Profs. Inczedy, Miziuke, Lorimer, Myasoedov and Dr. Ottaway.

The Nominations/Election Committee for 1983–1985 was appointed: Prof. T. Fujinaga, Chairman; Prof. G. Duyckaerts, Dr. A. Strasheim and Dr. J. White.

### Representation on IDCNS

Prof. M. Grasserbauer was nominated as the candidate of the Division to IDCNS for appointment by the IUPAC President. (Prof. Freiser had resigned his appointment.)

### ISO

Dr. White reported that 33 standard methods had been reviewed since the 31st General Assembly. The procedure for review continues to run smoothly, although in the past four months no new methods have been received for review. The Division will continue to review standard methods upon request by ISO.

### Division Think Tank

Prof. Grasserbauer reported on proposed projects that the Division should consider for future years. The report was received and noted. Future Divisional programs will be considered from this report. No further activity in this area is planned for the next biennium although the importance of advance planning was recognized to be vital to the Division's future.

### Radiochemistry and Nuclear Techniques

The Committee reviewed the report of the Working Group that had been appointed at the 31st General Assembly to address the problem of the suspended Commission V.7 on Analytical Radiochemistry and Nuclear Materials. Members of the Working Group were Profs. Grasserbauer, E. Roth (Inorganic Chemistry Division), E. Steines and M. deBruin. They recommended changing the name to "Commission on Radiochemistry and Nuclear Techniques" and identified a number of projects for a new work program. Dr. Schneider, IUPAC Vice-President, will recommend to the Bureau that the Analytical Chemistry Division be designated as "lead" Division for a new Interdivisional Commission on Radiochemistry and Nuclear Techniques and that the Division hold consultations with other interested Divisions. Dr. J. White was selected as the leader and preliminary discussions were held with other interested parties to line up a group of members to form the new Commission within the Analytical Chemistry Division.

Dr. J. C. White, Secretary, Division V.

### Division Projects

(a) Manual of Analytical Nomenclature

Prof. Freiser reviewed the progress of this project. He noted that Pergamon Press had expressed no interest in publishing a second edition of this work. It was decided to continue the project and seek a new publisher of what will be a continuing project. The cut-off date for the next edition will be September 1983 with publication by September 1985.

(b) Multilingual Dictionary

After the project had been discussed in much detail, the Committee decided to: (1) select terms from the *Manual of Analytical Nomenclature* (Prof. Pungor to decide which terms to be included), (2) define terms in English only at this point (Profs. West and Nancollas and Dr. Docherty will assist in finding people to do this task), (3) select September 1983 as the cut-off date. The anticipated completion date for the edition which will take the form of a multilingual appendix to the *Manual of Analytical Nomenclature* is expected to be prior to the 33rd General Assembly. By spring of 1984 it is anticipated that the work will be essentially completed.

(c) Trace Elements in Natural Waters
Prof. Nürnberg reported the progress of this project. Contributions have now been received from five Commissions with a report from the suspended Commission V.7 on radiochemical methods expected soon.

An editorial committee was formed to assist Prof. Nürnberg in compiling the reports into a report to be entitled *Methods for the Determination of Metals and Metalloids in Natural Waters,* compiled by the Analytical Chemistry Division, IUPAC.

**Reports from Commission Chairmen**
The Division Committee reviewed the Commissions' programs and approved them for submission to the Bureau. The Commissions' membership rosters were also approved for submission to the Bureau.

**Affiliate Memberships in IUPAC**
The Division Committee discussed the issue of Affiliate Membership in IUPAC and voted to endorse the concept as presented by Prof. West. It was noted that some opposition to Affiliate Membership had been voiced within several Commissions.

Prof. Pellerin announced that the IUPAC Congress in 1985 to be held in Manchester, England, will include sessions on analytical chemistry and urged the Division Committee to support this meeting.

Prof. Pellerin expressed his personal appreciation and that of the Division to retiring members of the Committee for their contributions to the Union.

**Next meeting**
The next meeting of the Analytical Chemistry Division will be held at the 33rd General Assembly in Lyon, France.

**J. C. White**

## Clinical Chemistry Division Committee:
### Lyngby, Denmark, 18 and 23 August 1983

**Division Committee Membership**
A. Kallner, M. Mikač-Dević, N. Montalbetti, K. Okuda, V. N. Titov and D. J. Vonderschmitt continue as Titular Members until 1985. F. W. Sunderman Jr. and S. S. Brown were re-elected as Titular Members for four-year terms (1983–1987). G. Ferard, C. Franzini, G. Hoxter, K. S. Kasprzak, S. Nomoto, B. Ribas, J. C. Rigg and R. Vihko were elected or re-elected Co-opted Members (1983–1985).

F. W. Sunderman Jr., S. S. Brown and N. Montalbetti were re-elected, respectively, as President, Vice-President (President-Elect) and Secretary (1983–1985).

**Subcommittee on Clinical Chemical Standards**
It has been decided to discontinue the Subcommittee but its activities will be carried on by the Titular Members of the Division Committee.

**Commission on Automation and Clinical Chemical Techniques (VII.1)**
C. A. Burtis and R. Haeckel continue as Titular Members and J. Büttner as Associate Member until 1985. J. Bierens de Haan and M. Hjelm were appointed Associate Members (1983–1987). P. A. Bonini and T. D. Geary were appointed Titular Members (1983–1987). R. Haeckel was appointed Chairman and T. D. Geary Secretary of the Commission (1983–1987).

The draft document *Nomenclature for Automated Analysis* will be reviewed during the next two months. Two new projects were started jointly with the Commission V.3:

(a) Electronic data processing and microprocessors in analytical and clinical chemistry.
(b) Bioanalytical nomenclature.

**Commission on Quantities and Units in Clinical Chemistry (VII.2)**
L. F. Bertello, D. Bangham, G. Férard and H. P. Lehmann were appointed Titular Members (1983–1987). C. Onkelinx and O. Siggaard-Andersen were appointed Associate Members (1983–1987). H. P. Lehmann was re-appointed Chairman (1983–1987) of the Commission.

The following projects were approved:

(a) Quantities and Units in Clinical Chemistry: Classification, Quantities and Units for ''Binding Assays'' in the Clinical Laboratory (1983–1986).
(b) Physico-Chemical Quantities and Units in Clinical Chemistry: Nomenclature of Derived Quantities. The draft document approved by the Division will be sent to IDCNS by December 1983.
(c) Quantities and Units in Clinical Chemistry: Optical Spectroscopy. Part I: Theoretical Outline and General Quantities (Specification of Radiation in Optical Spectroscopy, Quantities in Optical Spectroscopy, List of Quantities in Optical Spectroscopy). A revised draft will be submitted to the Division in a few months.
(d) Quantities and Units in Clinical Chemistry: Optical Spectroscopy; Molecular Absorption Spectroscopy. These will be continued as Commission V.4 projects.
(e) Quantities and Units in Clinical Chemistry: Nebulizer and Flame Properties in Flame Emission and Absorption Spectrometry. The draft document, approved by the Division, will be submitted to IDCNS by December 1983.
(f) Physico-chemical Quantities and Units in Clinical Chemistry with Special Emphasis in Activities and Activity Coefficients. It has been submitted to the Division for approval.

(g) A Special Unit for the Quantity: ''Number of Entities''. Opinion is to be solicited from a wide range of clinical laboratory scientists prior to submission of the project for Division and IDCNS approval.

(h) Quantities and Units for Metabolic Processes as a Function of Time. A draft document is in preparation. Expected compilation date 1986.

**Commission on Teaching of Clinical Chemistry (VII.3)**

C. C. Fraser continues as Titular Member until 1985. M. K. Schwartz, H. G. J. Worth and O. Zinder were re-appointed Titular Members (1983–1987). N. de Cediel was appointed Titular Member (1983–1987). M. Roth, V. N. Titov and R. Vihko continue as Associate Members until 1985. B. Straus was re-appointed Associate Member (1983–1987). J. M. Hicks, N. Montalbetti, C. Porter and C. W. H. Walker were appointed Associate Members (1983–1987). M. K. Schwartz and H. G. J. Worth were re-appointed Chairman and Secretary of the Commission.

The following projects were abandoned:

Self Instruction Material for Clinical Chemistry Education.

The Teaching Programmes in Developing Eastern Mediterranean Countries.

Teaching of Clinical Chemistry in Medical Curricula.

Monograph on Education Update.

The following projects were considered completed:

Teaching Programmes in South East Asia.

Teaching Programmes in Developing Countries.

It has been decided to continue the following projects:

A Basic Education and Training Framework for Medical Laboratory Technicians in Clinical Chemistry (1984).

Certification, Licensure and Accreditation Programmes for Clinical Chemistry (1984). In December 1983 a completed document will be circulated.

Preparation of Reference Catalogue of Audio-visual and Bibliographic Material for Teaching of Clinical Chemistry (1985).

The following new projects were approved:

Drugs Effects in Clinical Chemistry: Educational Aspects (1983–1986).

Teaching Guidelines for Clinical Chemists for Effective Communication of Laboratory Data (1983–1985).

Guidelines for Teaching Clinical Chemistry to Medical Students (1983–1987).

**Commission on Toxicology (VII.4)**

M. Mikač-Dević and M. Stoeppler continue as Titular Members and K. S. Kasprzak, K. Kühn, S. Nomoto, W. C. Purdy and Y. Thomassen as Associate Members. E. Nieboer was appointed Titular Member and A. Aitio and D. Shapcott Associate Members. J. Savory was appointed Chairman and D. B. Tonks Secretary.

It has been decided to establish a Chromium Subcommittee under the chairmanship of D. Shapcott.

The following projects were approved:

Development of Reference Methods and Reference Materials for Analysis of Aluminium in Biological Materials (1985).

Reliable Methods for Cadmium Analysis in Body Fluids (1986).

Beta-2-Microglobulin as an Index of Cd-Nephrotoxicity (1985).

Interlaboratory Survey of Blood Cadmium Analysis (1984).

Reference Materials and Methods for Analysis of Selenium in Biological Materials (1985).

The Evaluation of the Hydride Generation Technique in the Determination of Selenium in Human Serum by Atomic Absorption Spectroscopy (1984).

**N. Montalbetti**

## Commission III. 1 — Nomenclature of Organic Chemistry: Lyngby, Denmark, 14–20 August 1983

The Commission considered progress with the following projects:

**1. Hantzsch-Widman nomenclature.**

The revision of the extended Hantzsch-Widman system of nomenclature for heteromonocycles was completed with the publication of 1982 recommendations in PAC, Vol. 55, pp. 409-416 (1983).

**2. Numerical terms.**

Provisional recommendations for extending the numerical terms used in organic nomenclature beyond 199 appeared in PAC, Vol. 55, pp. 1463-1466 (1983).

**3. Treatment of variable valence in organic nomenclature (the $\lambda$-convention).**

Comments on the provisional recommendations (PAC, Vol. 55, pp. 217-227 (1983) were thoroughly considered and a revised publication accepted and submitted for approvals.

**4. Nodal numbering and Nomenclature for cyclophanes.**

Drafts of these documents were thoroughly discussed and approved for review by appropriate ''specialists'' under the new IUPAC publication procedure.

**5. Cyclic systems with contiguous formal double bonds (the $\delta$-convention).**

A document describing a method for unambiguously naming these cyclic systems by using the descriptor $\delta^c$, where $c$ is the number of formal double bonds terminating at a skeletal atom of a cyclic parent hydride was reviewed thoroughly and approved for review by appropriate ''specialists'' under the new IUPAC publication procedure.

**6. Revision of the 1979 edition of the** ***Nomenclature of Organic Chemistry.***

This project continues to receive much attention. The proposed outline for the revised rules was published in the synopsis minutes of the Commission's 1981 meeting in Leuven (CI, 1982, Supplement). Early drafts of subsections R-4 (Name construction) and R-7 (Criteria for selecting unique names) were reviewed, and modifications to subsection R-2 (parent hydrides) suggested.

**7. Fused-ring systems.**

A comprehensive documentation of procedures for naming complex fused and bridged-fused ring

*(Continued on p.49)*

# MEMBERSHIP LISTS OF IUPAC BODIES 1983-1985

(as at 20th December 1983)

| | |
|---|---|
| President: | Dr. W. G. SCHNEIDER, National Research Council of Canada, 100 Sussex Drive, Ottawa, Ontario K1A 0R6, Canada<br>(TEL: +1 (613) 993 9821. TELEX: 533715 NRC OTT) |
| Vice-President: | Prof. C. N. R. RAO, Jawaharlal Nehru Visiting Professor, Department of Physical Chemistry, University of Cambridge, Lensfield Road, Cambridge CB2 1EP, UK<br>(TEL: +44 (223) 66499. TELEX: 81240 CAMSPL) |
| Secretary General: | Prof. T. S. WEST, Macaulay Institute for Soil Research, Craigiebuckler, Aberdeen AB9 2QJ, UK<br>(TEL: +44 (224) 38611. TELEX: GB 73458 UNIABN) |
| Treasurer: | Prof. A. BJÖRKMAN, Instituttet for Kemiindustri, Danmarks Tekniske Højskole, Bygning 227, DK-2800 Lyngby, Denmark<br>(TEL: +45 (2) 884144. TELEX: 37529 DTHDIA) |
| Past-President: | Prof. S. NAGAKURA, Institute for Molecular Science, Myodaiji, Okazaki, Aichi, 444 Japan<br>(TEL: +81 (564) 52 9770. TELEX: 4537-475 KOKKEN) |

# IUPAC SECRETARIAT

Bank Court Chambers, 2-3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK
(TEL: +44 (865) 717744. TELEGRAMS: IUPAC OXFORD. TELEX: 83147 ATTN. IUPAC)

Dr. M. WILLIAMS
Executive Secretary

Miss ANN TROUGHTON
Deputy Executive Secretary

Mr. P. D. GUJRAL
Scientific Publications Secretary

Mr. R. W. FENNELL
Editor of Chemistry International

## EXECUTIVE COMMITTEE

Dr. W. G. Schneider (1981-1985)
President
Prof. C. N. R. Rao (1983-1985)
Vice-President
Prof. T. S. West (1983-1987)
Secretary General
Prof. A. Björkman (1984-1987)
Treasurer
Prof. S. Nagakura (1979-1985)
Past-President

### Elected Members

Prof. Y. Jeannin (1983-1987)
Prof. J. Michalski (1979-1985)
Prof. C. G. Overberger (1977-1985)

## BUREAU

Dr. W. G. Schneider (1981-1985)
President
Prof. C. N. R. Rao (1977-1985)
Vice-President
Prof. T. S. West (1983-1987)
Secretary General
Prof. A. Björkman (1984-1987)
Treasurer
Prof. S. Nagakura (1975-1985)
Past-President

### Elected Members

Dr. A. J. Arvía (1983-1987)
Argentina
Dr. J. W. Barrett (1977-1985)
United Kingdom
Prof. A. D. Campbell (1981-1985)
New Zealand
Prof. Y. Jeannin (1979-1987)
France
Prof. A. Kjaer (1977-1985)
Denmark
Prof. V. A. Koptyug (1979-1987)
Union of Soviet Socialist Republics
Prof. J. Michalski (1977-1985)
Poland
Prof. C. G. Overberger (1977-1985)
United States of America
Prof. D. B. Tonks (1979-1987)
Canada
Prof. A. A. Vlcek (1979-1987)
Czechoslovakia
Prof. H. Gg. Wagner (1979-1987)
Federal Republic of Germany

### Division Presidents

Dr. D. R. Lide, Jr. (1983-1987)
Physical Chemistry Division
Dr. Mary L. Good (1981-1985)
Inorganic Chemistry Division
Prof. G. Modena (1983-1985)
Organic Chemistry Division
Prof. C. H. Bamford (1981-1985)
Macromolecular Division
Prof. F. Pellerin (1981-1985)
Analytical Chemistry Division
Dr. H. Frehse (1981-1985)
Applied Chemistry Division
Prof. F. W. Sunderman, Jr. (1981-1985)
Clinical Chemistry Division

## CHEMRAWN COMMITTEE
(Established 1976)

Dr. B. W. Rossiter (1976-1984)
Chairman
Dr. H. Egan (1976-1984)
Secretary

### Members

Prof. J. B. Donnet (1982-1986)
Prof. C. G. Overberger (1976-1984)
Dr. R. Pariser (1982-1986)
Dr. G. S. Sidhu (1983-1987)
Dr. M. Uchida (1979-1987)
Prof. G. E. Zaikov (1976-1984)

### Associate Member

Dr. R. H. Marchessault (1982-1986)

## COMMITTEE ON CHEMISTRY AND INDUSTRY (COCI)
(Established 1977)

Prof. K. H. Büchel (1978-1986)
Chairman
Dr. G. Jäger (1979-1987)
Secretary

### Members

Dr. E. Blair (1983-1987)
Dr. R. Degain (1982-1986)
Dr. D. A. A. Fagandini (1983-1987)
Dr. P. L. C. Hao (1982-1986)
Dr. A. Brink (1984-1988)
Dr. V. Macho (1979-1987)
Dr. W. J. Mijs (1983-1987)
Ir. R. Mormont (1978-1986)
Dr. P. Rhyner (1978-1986)
Dr. A. El-Sawi Shoukry (1979-1987)
Prof. D. Sianesi (1978-1986)
Doc. K. Skagius (1979-1987)
Dr. K. Takeda (1981-1985)

## COMMITTEE ON PUBLICATIONS

(Established in its present form 1969)

Dr. D. P. den Os (1978-1986)
Chairman

### Members

Dr. S. Maričić (1979-1987)
Mr. T. H. G. Michael (1978-1986)
Dr. G. B. Munsch (1979-1987)
Dr. D. A. O'Sullivan (1981-1989)
Dr. I. A. Williams (1978-1986)

---

## PURE AND APPLIED CHEMISTRY EDITORIAL ADVISORY BOARD

Prof. D. H. Whiffen
Physical Chemistry Division
Prof. E. Fluck
Inorganic Chemistry Division
Prof. N. J. Leonard
Organic Chemistry Division
Prof. M. Mandel
Macromolecular Division
Prof. F. Pellerin
Analytical Chemistry Division
Dr. L. E. Coles
Applied Chemistry Division
Prof. W. C. Purdy
Clinical Chemistry Division

---

## CHEMISTRY INTERNATIONAL EDITORIAL ADVISORY BOARD

Prof. T. S. West (1983-1987)
Secretary General (Chairman)
Dr. H. Egan (1983-1985)
CHEMRAWN Committee
Dr. R. Degain (1983-1985)
Committee on Chemistry and Industry
Dr. D. P. den Os (1983-1985)
Committee on Publications
Prof. L. Paoloni (1983-1985)
Committee on Teaching of Chemistry
Dr. K. L. Loening (1983-1985)
Interdivisional Committee on Nomenclature and Symbols
Prof. K. S. W. Sing (1983-1985)
Physical Chemistry Division
Prof. E. Fluck (1983-1985)
Inorganic Chemistry Division
Prof. N. J. Leonard (1983-1985)
Organic Chemistry Division
Prof. M. Mandel (1983-1985)
Macromolecular Division
Prof. G. den Boef (1983-1985)
Analytical Chemistry Division
Dr. L. E. Coles (1983-1985)
Applied Chemistry Division
Prof. D. B. Tonks (1983-1985)
Clinical Chemistry Division

Mr. R. W. Fennell
Editor Chemistry International
(Secretary)

---

## COMMITTEE ON TEACHING OF CHEMISTRY (CTC)

(Established 1963)

Prof. D. J. Waddington (1977-1985)
Chairman
Prof. M. Chastrette (1981-1989)
Secretary

### Members

Prof. Marjorie Gardner (1981-1989)
Prof. E. Giesbrecht (1981-1989)
Prof. Aleksandra Kornhauser (1981-1989)
Prof. D. Samuel (1981-1989)
Prof. J. T. Shimozawa (1983-1991)
Prof. Evdokiya M. Sokolovskaya (1981-1989)

### National Representatives

Prof. A. I. Khodair (1981-1985)
Arab Republic of Egypt
Prof. A. H. Guerrero (1971-1985)
Argentina
Dr. R. B. Bucat (1983-1985)
Australia
Dr. Edith Jarisch (1983-1985)
Austria
Prof. G. Geuskens (1978-1985)
Belgium
Dr. R. Isuyama (1983-1985)
Brazil
Prof. D. L. Lazarov (1983-1985)
Bulgaria
Prof. B. T. Newbold (1970-1985)
Canada
Prof. S.-M. Wang (1983-1985)
Chemical Society located in Taipei, China
Prof. T. Hua (1983-1985)
Chinese Chemical Society
Prof. R. Acevedo (1983-1985)
Cuba
Prof. J. Horák (1983-1985)
Czechoslovakia
Prof. E. Rancke-Madsen (1970-1985)
Denmark
Dr. Ursula Hofacker (1975-1983)
Federal Republic of Germany
Prof. H. Saarinen (1983-1985)
Finland
Prof. J. L. Rivail (1982-1985)
France
Prof. H. Bremer (1975-1985)
German Democratic Republic
Prof. Irene Dilaris (1976-1985)
Greece
Prof. C. Szántay (1977-1985)
Hungary
Prof. B. Venkataraman (1983-1985)
India
Mr. P. A. Start (1974-1985)
Ireland
Prof. A. Shani (1983-1985)
Israel

Prof. L. Paoloni (1979-1985)
Italy
Prof. Su Eng Loke (1982-1985)
Malaysia
Dr. Clarisse Habraken (1978-1985)
Netherlands
Mr. T. R. Hitchings (1969-1983)
New Zealand
Mrs. Vivi Ringnes (1980-1985)
Norway
Prof. I. Z. Siemion (1983-1985)
Poland
Dr. Mariana P. B. A. Pereira (1979-1985)
Portugal
Prof. G. C. Gerrans (1977-1985)
Republic of South Africa
Prof. C. I. Simionescu (1970-1985)
Romania
Prof. J. Morcillo Rubio (1978-1985)
Spain
Prof. N. G. Vannerberg (1976-1985)
Sweden
Prof. G. H. Wagnière (1978-1985)
Switzerland
Prof. C. B. Senvar (1983-1985)
Turkey
Prof. C. C. Addison (1979-1985)
United Kingdom
Prof. J. J. Lagowski (1983-1985)
United States of America
Dr. L. Cortés (1971-1985)
Venezuela

## FINANCE COMMITTEE (FC)

(Established in its present form 1963)

Dr. H. F. Wilson (1979-1989)
Chairman

### Members

Dr. P. J. Agius (1977-1985)
Dr. W. Fritsche (1981-1989)
Dr. A. Hartmann (1979-1987)
Dr. T. Miki (1983-1991)
Prof. G. E. Zaikov (1983-1985)

### Ex officio Member

Prof. A. Björkman (1984-1987)

## INTERDIVISIONAL COMMITTEE ON NOMENCLATURE AND SYMBOLS (IDCNS)

(Established in its present form 1975)

Dr. K. L. Loening (1976-1984)
Chairman
Dr. R. B. Fox (1979-1987)

### Members

Prof. D. H. Whiffen (1975-1985)
Physical Chemistry Division
Dr. T. D. Coyle (1981-1985)
Inorganic Chemistry Division
Prof. V. Gold (1979-1987)
Organic Chemistry Division
Prof. A. D. Jenkins (1979-1987)
Macromolecular Division
Prof. M. Grasserbauer (1983-1987)
Analytical Chemistry Division
Mr. S. G. Luxon (1983-1987)
Applied Chemistry Division
Dr. R. Zender (1983-1987)
Clinical Chemistry Division

### Associate Members

Prof. K. Kuchitsu (1983-1987)
Physical Chemistry Division
Prof. J. Reedijk (1981-1985)
Inorganic Chemistry Division
Dr. W. H. Powell (1983-1987)
Organic Chemistry Division
Prof. W. Ring (1979-1987)
Macromolecular Division
Prof. Yu. A. Zolotov (1981-1985)
Analytical Chemistry Division
Dr. H. Egan (1983-1987)
Applied Chemistry Division
Dr. M. Roth (1981-1985)
Clinical Chemistry Division

### Bureau International des Poids et Mesures

Dr. T. J. Quinn

### International Organization for Standardization

Mr. A. Thor

### International Union of Biochemistry

Dr. H. B. F. Dixon

### International Union of Nutritional Sciences

Dr. S. R. Ames

## IUB-IUPAC JOINT COMMISSION ON BIOCHEMICAL NOMENCLATURE (JCBN)

(Attached to IDCNS. Established in its present form 1977)

Dr. H. B. F. Dixon (IUB)
Chairman
Dr. A. Cornish-Bowden (IUPAC, 1983-1987)
Secretary

Members

Prof. C. Liébecq (IUB)
Dr. K. L. Loening (IUPAC, 1977-1985)
Dr. G. P. Moss (IUPAC, 1978-1986)
Prof. J. Reedijk (IUPAC, 1981-1985)
Prof. S. F. Velick (IUB)
Prof. J. F. G. Vliegenthart (IUB)

---

## IUB-IUPAB-IUPAC COMMISSION ON BIOTHERMODYNAMICS (CB)

(Attached to Physical Chemistry Division. Established 1975)

Prof. I. Wadsö (IUPAC, 1975-1984)
Chairman

Members

Prof. H. Eisenberg (IUPAB)
Prof. M. Klingenberg (IUB)
Prof. W. Pfeil (IUB)

Associate Members

Dr. A. E. Beezer
Prof. J. P. Belaich
Prof. S. J. Gill
Prof. L. G. Hepler
Dr. H.-J. Hinz
Prof. G. Rialdi
Prof. H. Suga

---

## IUPAC REPRESENTATIVES ON OTHER ORGANIZATIONS

ICSU General Committee

Prof. T. S. West (1983-1985)

ICSU Abstracting Board (IAB)

ICSU Commission on Application of Science to Agriculture, Forestry and Aquaculture (CASAFA)

Prof. J. B. Donnet (1982-1985)

ICSU Committee on Data for Science and Technology (CODATA)

Prof. E. F. Westrum, Jr. (1983-1985)

ICSU Committee on Science and Technology in Developing Countries (COSTED)

Prof. D. J. Waddington (1981-1985)

ICSU Committee on Space Research (COSPAR)

Prof. C. Ponnamperuma (1976-1985)

ICSU Committee on Teaching of Science (CTS)

Prof. D. J. Waddington (1979-1985)

ICSU Scientific Committee on Genetic Experimentation (COGENE)

Dr. R. W. F. Hardy (1981-1985)

ICSU Scientific Committee on Problems of the Environment (SCOPE)

Dr. P. C. Kearney (1982-1985)

ICSU-UATI Committee on Water Research (COWAR)

Inter-Union Commission on Spectroscopy (IUCS)

Dr. R. N. Jones (1979-1985)
Dr. D. W. Turner (1979-1985)

International Congress on Catalysis

Prof. J. Haber (1979-1985)

International Federation of Clinical Chemistry (IFCC)

Prof. F. W. Sunderman, Jr. (1981-1985)
Prof. N. Montalbetti (1981-1985)

International Organization of Chemical Sciences in Development (IOCD)

Prof. C. N. R. Rao (1983-1985)

ISO/TC 12: Quantities, Symbols, Conversion Factors, and Conversion Tables

Prof. D. H. Whiffen (1977-1985)

IUPAP Commission on Symbols, Units, Nomenclature, Atomic Masses, and Fundamental Constants

Prof. D. H. Whiffen (1976-1985)

International Union of Toxicology (IUTOX)

Prof. F. W. Sunderman, Jr. (1982-1985)

International Committee for Standardization in Haematology (ICSH)

Prof. M. Hjelm (1981-1985)

Commission on World Standards in Clinical Pathology (COWS) of World Association of Societies of Pathology (WASP)

Prof. K. Okuda (1983-1985)

IUPHAR Section on Toxicology

Dr. K. Kühn (1983-1985)

# PHYSICAL CHEMISTRY DIVISION (I)

(Established 1949)

## DIVISION COMMITTEE

Dr. D. R. Lide, Jr. (1979-1987)
President
Prof. K. I. Zamaraev (1979-1987)
Vice-President
Prof. N. Sheppard (1975-1985)
Past-President
Dr. E. D. Becker (1977-1985)
Secretary

### Members

Dr. K. N. Marsh (1981-1985)
Dr. R. Parsons (1981-1985)
Prof. G. M. Schneider (1981-1985)
Prof. K. Tamaru (1983-1987)

### Coopted Members

Prof. J. Lu
Dr. S. Veprek
Prof. I. Wadsö

## SUBCOMMITTEE ON PHYSICOCHEMICAL MEASUREMENTS AND STANDARDS

Dr. K. N. Marsh
Chairman
Dr. A. J. Head
Secretary

### Members

Dr. E. Brunner
Prof. L. Crovini
Mr. G. Girard
Prof. D. V. S. Jain
Dr. E. Juhász
Dr. W. Künzel
Prof. B. Le Neindre
Mr. S. D. Rasberry
Dr. R. Sabbah
Prof. K. Wandelburg
Drs. H. F. van Wijk

## SUBCOMMITTEE ON PLASMA CHEMISTRY

Dr. S. Veprek
Chairman
Prof. M. Boulos
Vice-Chairman

### Members

Prof. J. Amouroux
Prof. R. Avni
Prof. R. D'Agostino
Dr. J. Dieleman
H. Drost
Prof. P. Fauchais
Dr. D. L. Flamm
Dr. G. K. Herb
Prof. W. Lindinger
Dr. S. Morita
Prof. E. Pfender
Dr. Z. W. Sternberg
Dr. B. Waldie
Prof. H. Wilhelmi

## COMMISSION ON PHYSICOCHEMICAL SYMBOLS, TERMINOLOGY, AND UNITS (I.1)

(Established in its present form 1936)

### Titular Members

Prof. K. Kuchitsu (1979-1987)
Chairman
Dr. N. Kallay (1977-1985)
Secretary
Prof. E. T. Denisov (1981-1985)
Prof. K. H. Homann (1979-1987)
Prof. I. M. Mills (1983-1987)
Mr. D. D. Wagman (1981-1985)

### Associate Members

Prof. R. Alberty (1983-1987)
Dr. I. Ansara (1983-1987)
Dr. E. R. Cohen (1979-1987)
Prof. A. Schuyff (1979-1987)
Prof. D. H. Whiffen (1977-1985)

### National Representatives

Prof. M. A. G. Cecchini (1983-1985)
Brazil
Prof. L. Treindl (1981-1985)
Czechoslovakia
Dr. E. Juhász (1983-1985)
Hungary
Dr. S. P. Koh (1983-1985)
Malaysia

## COMMISSION ON THERMODYNAMICS (I.2)

(Established in its present form 1977)

### Titular Members

Prof. G. M. Schneider (1975-1985)
Chairman
Dr. S. Angus (1977-1985)
Secretary
Prof. R. D. Freeman (1983-1987)
Dr. V. A. Medvedev (1977-1985)

Prof. G. Somsen (1983-1987)
Prof. W. Zielenkiewicz (1977-1985)

Associate Members

Prof. J. M. G. Barthel (1983-1987)
Prof. J. C. G. Calado (1983-1987)
Dr. M. B. Ewing (1981-1985)
Dr. H. V. Kehiaian (1981-1985)
Prof. I. L. Khodakovskii (1983-1987)
Prof. P. A. G. O'Hare (1981-1985)
Dr. Gerd Olofsson (1981-1985)
Prof. J. Pick (1983-1987)
Prof. Margit T. Rätzsch (1981-1985)
Dr. J. Rouquérol (1981-1985)
Prof. H. Suga (1981-1985)

National Representatives

Prof. J. C. Ahluwalia (1983-1985)
India
Prof. I. Michaeli (1983-1985)
Israel
Dr. D. Marchidan (1981-1985)
Romania

---

## SUBCOMMITTEE ON THERMODYNAMIC TABLES

Dr. H. V. Kehiaian
Chairman
Dr. H. J. White, Jr.
Secretary

Members

Dr. S. Angus
Prof. F. Kohler
Dr. S. Malanowski
Dr. W. A. Wakeham
Prof. K. Watanabe

---

## SUBCOMMITTEE ON TRANSPORT PROPERTIES

Prof. J. Kestin
Chairman
Dr. W. A. Wakeham
Secretary

Members

Dr. S. Angus
Dr. H. Hanley
Prof. A. Nagashima
Prof. C. A. Nieto de Castro
Prof. H. A. Øye
Prof. K. Stephan

---

## COMMISSION ON ELECTROCHEMISTRY (I.3)

(Established 1951)

Titular Members

Prof. S. Trasatti (1975-1985)
Chairman
Dr. K. Niki (1977-1985)
Secretary
Prof. L. R. Faulkner (1983-1987)
Prof. G. Gritzner (1983-1987)
Prof. D. Landolt (1983-1987)
Dr. R. Memming (1983-1987)

Associate Members

Dr. J. N. Agar (1979-1987)
Dr. A. Bewick (1983-1987)
Prof. E. Budevski (1979-1987)
Prof. K. E. Heusler (1983-1987)
Dr. J. C. Justice (1983-1987)
Prof. J. Koryta (1983-1987)
Prof. V. M. M. Lobo (1983-1987)
Dr. B. Miller (1979-1987)
Dr. R. Parsons (1981-1985)
Prof. O. A. Petrii (1983-1987)
Dr. J. A. Plambeck (1979-1987)
Dr. A. Yamada (1983-1987)

National Representatives

Dr. A. J. Arvía (1980-1985)
Argentina
Prof. T. Rabockay (1983-1985)
Brazil
Prof. B. E. Conway (1979-1985)
Canada
Dr. G. Horányi (1979-1985)
Hungary
Prof. S. K. Rangarajan (1981-1985)
India
Prof. E. Gileadi (1983-1985)
Israel
Prof. J. W. Tomlinson (1973-1985)
New Zealand
Prof. Z. Zembura (1983-1985)
Poland
Prof. E. Mattsson (1981-1985)
Sweden
Dr. A.K. Covington (1979-1985)
United Kingdom
Prof. D. Dražič (1981-1985)
Yugoslavia

---

## COMMISSION ON CHEMICAL KINETICS (I.4)

(Established 1983)

Members to be appointed

## COMMISSION ON MOLECULAR STRUCTURE AND SPECTROSCOPY (I.5)
(Established 1955)

### Titular Members

Prof. J. R. Durig (1981-1985)
Chairman
Dr. H. A. Willis (1983-1987)
Secretary
Dr. A. B. Bradshaw (1983-1987)
Dr. B. G. Derendjaev (1983-1987)
Prof. S. Forsen (1983-1987)
Dr. J. F. J. Todd (1979-1987)

### Associate Members

Prof. R. D. Brown (1983-1985)
Dr. Jeannette G. Grasselli (1977-1985)
Prof. R. K. Harris (1981-1985)
Dr. H. Kon (1983-1987)
Prof. Yu. N. Molin (1983-1987)
Prof. W. B. Person (1981-1985)
Prof. H. Ratajczak (1979-1985)
Prof. C. J. H. Schutte (1981-1985)
Prof. M. Tasumi (1981-1985)

### National Representatives

Prof. R. Colin (1981-1985)
Belgium
Prof. Y. Kawano (1983-1985)
Brazil
Dr. G. Herzberg (1977-1985)
Canada
Prof. J. Lu (1981-1985)
Chinese Chemical Society
Prof. Z. Luz (1983-1985)
Israel
Prof. S. Ng (1983-1985)
Malaysia
Prof. Bogusława Jeżowska-Trzebiatowska
(1979-1985)
Poland

---

## SUBCOMMITTEE ON INFRARED AND RAMAN SPECTROSCOPY

Prof. G. Zerbi
Chairman

### Members

Prof. S. Brodersen
Prof. A. R. H. Cole
Prof. M. Delhaye
Prof. L. A. Gribov
Dr. R. N. Jones
Prof. W. Kiefer
Dr. A. L. Smith
Prof. A. H. Zewail

---

## SUBCOMMITTEE ON MASS SPECTROSCOPY

Dr. J. F. J. Todd
Chairman

### Members

Prof. J. H. Beynon
Prof. K. Biemann
Prof. H.-F. Grützmacher
Prof. A. Mandelbaum
Prof. J. Marsel
Prof. E. Roth
Prof. V. I. Tal'rose
Prof. M. Tsuchiya

---

## SUBCOMMITTEE ON NOTATIONS AND CONVENTIONS FOR MOLECULAR SPECTROSCOPY

Prof. C. J. H. Schutte
Chairman

### Members

Dr. P. R. Bunker
Prof. M. A. Elyashêvich
Dr. G. Herzberg
Dr. J. T. Hougen
Prof. I. M. Mills
Prof. R. S. Mulliken
Prof. P. M. de Wolff

---

## COMMISSION ON COLLOID AND SURFACE CHEMISTRY INCLUDING CATALYSIS (I.6)
(Established in its present form 1979)

### Titular Members

Prof. K. S. W. Sing (1983-1987)
Chairman
Prof. J. Haber (1977-1985)
Vice-Chairman
Prof. E. Wolfram (1979-1987)
Secretary
Prof. J. H. Block (1983-1987)
Dr. P. Stenius (1983-1987)
Dr. Lisbeth Ter-Minassian-Saraga
(1983-1987)

### Associate Members

Dr. N. V. Churaev (1979-1987)
Dr. P. C. Gravelle (1977-1985)
Prof. J. Hightower (1983-1987)
Prof. R. J. Hunter (1979-1987)
Dr. A. Maroto (1983-1987)
Dr. J. Rouquêrol (1983-1987)
Prof. P. Wells (1983-1987)

### National Representatives

Prof. G. F. Froment (1981-1985)
Belgium
Prof. L. Ionesco (1983-1985)
Brazil

Dr. S. G. Mason (1979-1985)
  Canada
Prof. A. Weiss (1983-1985)
  Federal Republic of Germany
Prof. K. Meyer (1981-1985)
  German Democratic Republic
Prof. L. G. Nagy (1979-1985)
  Hungary
Prof. A. S. Kertes (1979-1985)
  Israel
Prof. J. C. Kuriacose (1983-1985)
  India
Prof. A. Kitahara (1979-1985)
  Japan
Prof. J. Lyklema (1983-1985)
  Netherlands
Dr. J. A. Pajares (1983-1985)
  Spain
Prof. D. H. Everett (1975-1985)
  United Kingdom

---

## SUBCOMMITTEE ON CATALYST CHARACTERIZATION

Prof. J. Haber
  Chairman
Prof. J. H. Block
  Secretary

Members

Prof. G. F. Froment
Dr. P. C. Gravelle
Prof. R. S. Hansen
Prof. R. A. W. Haul
Prof. J. Hightower
Dr. J. A. Pajares
Prof. L. Rieckert
Prof. M. W. Roberts
Prof. K. S. W. Sing
Prof. K. Tamaru
Prof. P. Wells

---

## SUBCOMMITTEE ON CHEMICAL PHYSICS OF SURFACES

Prof. R. S. Hansen
  Chairman

Members

Prof. J. H. Block
Dr. P. C. Gravelle
Prof. J. Haber
Prof. K. Meyer
Prof. M. W. Roberts
Prof. K. Tamaru

---

# INORGANIC CHEMISTRY DIVISION (II)

(Established 1949)

## DIVISION COMMITTEE

Dr. Mary L. Good (1979-1985)
President
Prof. Kazuo Saito (1977-1985)
Vice-President
Prof. E. Fluck (1981-1985)
Secretary

### Members

Prof. M. T. Beck (1983-1987)
Dr. R. Hagemann (1983-1987)
Dr. J. Hlaváč (1981-1985)
Prof. A. B. P. Lever (1983-1987)
Prof. A. M. Sargeson (1983-1987)

### Coopted Members

Prof. N. N. Greenwood
Dr. N. E. Holden
Prof. Y. Jeannin )
Prof. K. L. Komarek ) Ex officio
Prof. R. L. Martin )

## COMMISSION ON ATOMIC WEIGHTS AND ISOTOPIC ABUNDANCES (II.1)

(Established in its present form 1979)

### Titular Members

Prof. R. L. Martin (1975-1985)
Chairman
Dr. J. R. de Laeter (1983-1987)
Secretary
Prof. R. C. Barber (1979-1987)
Dr. I. L. Barnes (1975-1985)
Dr. T. J. Murphy (1979-1987)
Prof. Q. Zhang (1983-1987)

### Associate Members

Prof. P. De Bièvre (1981-1985)
Dr. T. B. Coplen (1983-1987)
Prof. K. G. Heumann (1983-1987)
Dr. N. E. Holden (1983-1987)
Prof. W. H. Johnson (1981-1985)
Dr. H. S. Peiser (1975-1985)
Dr. C. E. Rees (1983-1987)
Dr. K. J. R. Rosman (1983-1987)
Dr. Masako Shima (1981-1985)

### National Representatives

Prof. P. S. Goel (1983-1985)
India
Prof. J. R. Gat (1983-1985)
Israel
Prof. M. Ghazali bin Hj. Abdul Rahman (1983-1985)
Malaysia
Prof. V. I. Goldanskii (1979-1985)
Union of Soviet Socialist Republics
Prof. N. N. Greenwood (1983-1985)
United Kingdom

## COMMISSION ON NOMENCLATURE OF INORGANIC CHEMISTRY (II.2)

(Established 1921)

### Titular Members

Prof. Y. Jeannin (1971-1985)
Chairman
Prof. D. H. Busch (1979-1987)
Vice-Chairman
Dr. T. D. Coyle (1979-1987)
Secretary
Prof. E. Fluck (1979-1987)
Dr. Piroska Fodor-Csányi (1979-1987)
Dr. G. J. Leigh (1973-1985)
Prof. J. Reedijk (1979-1987)
Dr. E. Samuel (1981-1985)

### Associate Members

Dr. M. W. G. de Bolster (1983-1987)
Dr. K. Ch. Buschbeck (1979-1985)
Prof. J. A. Connor (1981-1985)
Mr. E. W. Godly (1979-1987)
Dr. R. Laitinen (1981-1985)
Prof. R. C. Mehrotra (1981-1985)
Prof. J. F. Nixon (1981-1985)
Dr. K. Samuelsson (1981-1985)
Mr. T. E. Sloan (1979-1987)

### National Representatives

Prof. L. F. Bertello (1979-1985)
Argentina
Prof. A. M. Sargeson (1980-1985)
Australia
Prof. A. C. Massabni (1983-1985)
Brazil
Dr. M. Zikmund (1978-1985)
Czechoslovakia
Prof. K. Yamasaki (1979-1985)
Japan
Dr. L. Y. Goh (1983-1985)
Malaysia
Dr. D. Purdela (1978-1985)
Romania
Dr. V. Simeon (1981-1985)
Yugoslavia

## COMMISSION ON HIGH TEMPERATURE AND SOLID STATE CHEMISTRY (II.3)

(Established in its present form 1981)

### Titular Members

Prof. K. L. Komarek (1977-1985)
Chairman
Prof. P. W. Gilles (1977-1985)
Secretary
Dr. Anne-Marie Anthony (1977-1985)
Prof. L. V. Gurvich (1979-1987)
Prof. R. Metselaar (1983-1987)
Prof. G. Petzow (1979-1985)
Dr. M. H. Rand (1979-1987)

### Associate Members

Prof. C. B. Alcock (1979-1985)
Prof. J. Corish (1983-1987)
Dr. J.-P. Coutures (1979-1985)
Prof. J. Drowart (1981-1985)
Prof. E. Fitzer (1977-1985)
Dr. J. Hastie (1981-1985)
Dr. M. G. Hocking (1979-1987)
Prof. L. H. E. Kihlborg (1983-1987)
Dr. R. W. Ohse (1973-1985)
Prof. R. Sersale (1977-1985)
Prof. W. L. Worrell (1977-1985)
Prof. H. Yanagida (1983-1987)

### National Representatives

Dr. M. S. E. El-Sewefy (1980-1985)
Arab Republic of Egypt
Dr. E. R. McCartney (1969-1985)
Australia
Prof. T.-S. Yen (1980-1985)
Chinese Chemical Society
Prof. J. Matoušek (1981-1985)
Czechoslovakia
Dr. J. F. Baumard (1982-1985)
France
Prof. R. Vernerkar (1983-1985)
India
Prof. G. de Maria (1982-1985)
Italy
Dr. Badri Muhammad (1983-1985)
Malaysia
Dr. J. B. Clark (1983-1985)
Republic of South Africa
Prof. A. Magnéli (1969-1985)
Sweden
Prof. G. Bayer (1975-1985)
Switzerland
Prof. G. M. Rosenblatt (1978-1985)
United States of America
Prof. M. M. Ristić (1975-1985)
Yugoslavia

---

## SUBCOMMITTEE ON CHARACTERIZATION AND TERMINOLOGY OF CARBON AND GRAPHITE

Prof E. Fitzer
Chairman

### Members

Prof. R. C. Bansal
Prof. H. P. Boehm
Prof. L. Bonnetain
Prof. R. J. Diefendorf
Prof. J. B. Donnet
Dr. W. B. Eatherly
Dr. G. B. Engle
Prof. D. B. Fischbach
Prof. M. Inagaki
Dr. B. McEnaney
Prof. H. Marsh
Dr. R. A. Meyer
Dr. E. G. Morris
Prof. S. Mrozowski
Dr. F. Rozploch
Dr. R. Setton
Prof. E. Stumpp
Prof. T. Tsuzuku
Prof. A. R. Ubbelohde

# ORGANIC CHEMISTRY DIVISION (III)

(Established 1949)

## DIVISION COMMITTEE

Prof. G. Modena (1975-1985)
President
Prof. J. F. Bunnett (1977-1985)
Vice-President
Prof. J. Mathieu (1977-1985)
Past-President
Dr. Sukh Dev (1981-1987)
Secretary

### Members

Prof. N. J. Leonard (1981-1985)
Prof. M. Oki (1983-1987)
Prof. M. Protiva (1981-1985)
Prof. R. A. Rossi (1983-1987)

### Coopted Members

Prof. Irine P. Beletskaya
Prof. S. Gronowitz
Prof. W.-Y. Huang
Dr. W. Koch
Dr. J. T. Marvel
Prof. K. Schaffner

### National Representatives

Prof. J. A. Retamar (1980-1985)
Argentina
Prof. J. R. Cannon (1982-1985)
Australia
Prof. G. L'abbe (1981-1985)
Belgium
Prof. Maria A. Kaplan (1983-1985)
Brazil
Prof. W.-Y. Huang (1981-1985)
Chinese Chemical Society
Prof. G. Deák (1979-1985)
Hungary
Prof. G. Mehta (1983-1985)
India
Prof. K. C. Chan (1983-1985)
Malaysia
Dr. J. R. Bull (1983-1985)
Republic of South Africa
Prof. A. T. Balaban (1983-1985)
Romania

---

## COMMISSION ON NOMENCLATURE OF ORGANIC CHEMISTRY (III.1)

(Established 1921)

### Titular Members

Dr. G. P. Moss (1977-1985)
Chairman
Prof. D. Hellwinkel (1979-1987)
Vice-Chairman
Dr. W. H. Powell (1979-1987)
Secretary
Prof. O. Achmatowicz (1979-1987)
Dr. A. D. McNaught (1979-1987)
Prof. R. Panico (1981-1985)
Prof. J. C. Richer (1979-1987)
Prof. P. A. S. Smith (1983-1987)

### Associate Members

Dr. K. Bláha (1979-1987)
Prof. H. J. T. Bos (1983-1987)
Dr. A. J. Boulton (1981-1985)
Dr. P. M. Giles, Jr. (1983-1987)
Mr. E. W. Godly (1979-1987)
Dr. H. Gutmann (1983-1987)
Dr. K. Hirayama (1983-1987)
Mr. S. P. Klesney (1979-1985)
Prof. N. Lozac'h (1979-1987)
Prof. J. Rigaudy (1981-1985)
Mr. R. Schoenfeld (1981-1985)
Dr. O. Weissbach (1979-1987)

---

## COMMISSION ON PHYSICAL ORGANIC CHEMISTRY (III.2)

(Established 1973)

### Titular Members

Prof. V. Gold (1983-1987)
Chairman
Dr. R. A. Y. Jones (1981-1985)
Secretary
Prof. E. A. Halevi (1981-1985)
Prof. G. Illuminati (1977-1985)
Prof. W. P. Jencks (1981-1985)
Prof. O. M. Nefedov (1981-1985)
Prof. K. Schwetlick (1977-1985)

### Associate Members

Prof. J. F. Bunnett (1983-1987)
Prof. M. P. Doyle (1979-1987)
Prof. R. D. Guthrie (1977-1985)
Dr. J. S. Littler (1979-1987)
Prof. J. March (1977-1985)
Prof. P. Müller (1981-1985)
Dr. J. R. Penton (1981-1985)
Dr. J. Toullec (1981-1985)

### National Representatives

Prof. P. van Brandt (1983-1985)
Belgium
Prof. E. Humeres (1983-1985)
Brazil
Prof. X. Jiang (1980-1985)
Chinese Chemical Society
Prof. M. Nógrádi 1980-1985)
Hungary

Prof. D. J. McLennan (1982-1985)
New Zealand
Prof. A. T. Balaban (1981-1985)
Romania
Prof. P. N. I. Ahlberg (1980-1985)
Sweden
Prof. M. Lj. Mihailović (1979-1985)
Yugoslavia

---

## COMMISSION ON PHOTOCHEMISTRY (III.3)

(Established in its present form 1975)

### Titular Members

Prof. F. C. De Schryver (1975-1985)
Chairman
Prof. S. E. Braslavsky (1983-1987)
Secretary
Prof. K. N. Houk (1977-1985)
Prof. H. Iwamura (1983-1987)
Prof. J. Michl (1981-1985)
Prof. K. Tokumaru (1979-1987)

### Associate Members

Dr. D. F. Eaton (1981-1985)
Dr. A. Heller (1983-1987)
Prof. M. G. Kuzmin (1981-1985)
Prof. C. Sandorfy (1977-1985)
Prof. F. Wilkinson (1981-1985)

### National Representatives

Prof. A. M. Osman (1973-1985)
Arab Republic of Egypt
Prof. O. P. Strausz (1979-1985)
Canada
Prof. K. Lempert (1980-1985)
Hungary
Prof. M. V. George (1983-1985)
India
Prof. E. Fischer (1983-1985)
Israel
Dr. Ibrahim bin Abdullah (1983-1985)
Malaysia
Prof. J. W. Verhoeven (1981-1985)
Netherlands

---

## COMMISSION ON MEDICINAL CHEMISTRY (III.4)

(Under Review)

---

# MACROMOLECULAR DIVISION (IV)

(Established 1967)

## DIVISION COMMITTEE

Prof. C. H. Bamford (1975-1985)
President
Prof. T. Saegusa (1979-1985)
Vice-President
Prof. M. Mandel (1977-1985)
Secretary

### Members

Dr. P. L. Clegg (1983-1987)
Prof. W. Heitz (1983-1987)
Prof. E. M. Pearce (1983-1987)
Prof. N. A. Platé (1981-1985)
Prof. P. Sigwalt (1983-1987)

### Coopted Members

Dr. M. E. Carrega
Prof. G. Challa
Dr. J. Economy
Prof. N. Ise
Prof. M. Kryszewski
Dr. H. Lange
Prof. D. C. Pepper
Prof. B. Philipp
Prof. P. Pino
Prof. A. Silberberg
Prof. C. I. Simionescu

### National Representatives

Prof. O. Olaj (1979-1985)
Austria
Prof. E. Goethals (1981-1985)
Belgium
Prof. Eloisa B. Mano (1979-1985)
Brazil
Prof. I. M. Panayotov (1968-1985)
Bulgaria
Prof. L. E. St. Pierre (1979-1985)
Canada
Prof. J. Kops (1974-1985)
Denmark
Prof. W. Ring (1983-1985)
Federal Republic of Germany
Prof. J. J. Lindberg (1971-1985)
Finland
Prof. G. Reinisch (1982-1985)
German Democratic Republic
Prof. G. Hardy (1975-1985)
Hungary
Prof. D. D. Deshpande (1983-1985)
India
Prof. M. Lewin (1983-1985)
Israel
Prof. M. Farina (1976-1985)
Italy
Prof. A. Nakajima (1981-1985)
Japan
Prof. A. Bantjes (1982-1985)
Netherlands
Dr. I. E. Ruyter (1980-1985)
Norway
Prof. Z. J. Jedlinski (1983-1985)
Poland
Prof. E. W. Neuse (1976-1985)
Republic of South Africa
Dr. E. V. Dobrescu (1981-1985)
Romania
Prof. J. G. Fatou (1982-1985)
Spain
Prof. B. Rånby (1969-1985)
Sweden
Prof. V. A. Kabanov (1983-1985)
Union of Soviet Socialist Republics
Prof. D. H. Richards (1983-1985)
United Kingdom
Dr. B. C. Anderson (1983-1985)
United States of America
Dr. E. Paredes (1981-1985)
Venezuela

### Representative of ICR

Dr. A. J. de Vries

### Representative of IUPAB

Prof. H. A. Scheraga

### Representative of IUPAP

Prof. G. W. Becker

---

## COMMISSION ON MACROMOLECULAR NOMENCLATURE (IV.1)

(Established 1968)

### Titular Members

Prof. A. D. Jenkins (1975-1983)
Chairman
Dr. N. M. Bikales (1977-1985)
Secretary
Prof. G. Allegra (1977-1985)
Dr. R. Bareiss (1983-1987)
Dr. P. Kratochvîl (1979-1987)
Prof. I. Mita (1979-1987)
Prof. I. M. Papisov (1979-1987)
Prof. U. W. Suter (1981-1985)

### Associate Members

Prof. D. Braun (1981-1985)
Prof. J. M. G. Cowie (1983-1987)
Dr. L. G. Donaruma (1977-1985)
Dr. K. L. Loening (1977-1985)
Dr. R. H. Marchessault (1983-1987)
Prof. R. P. Quirk (1983-1987)
Prof. Marguerite Rinaudo (1981-1985)
Prof. P. Sigwalt (1983-1987)
Prof. L.-O. Sundelöf (1981-1985)

### National Representatives

Prof. Eloisa B. Mano (1979-1985)
  Brazil
Prof. L. Shi (1983-1985)
  Chinese Chemical Society
Dr. A. S. Tan (1983-1985)
  Malaysia
Dr. G. J. Leary (1982-1985)
  New Zealand
Prof. N. A. Platé (1983-1985)
  Union of Soviet Socialist Republics

---

## COMMISSION ON POLYMER CHARACTERIZATION AND PROPERTIES (IV.2)

(Established 1973)

### Titular Members

Dr. P. L. Clegg (1975-1985)
  Chairman
Dr. R. E. Wetton (1977-1985)
  Secretary
Prof. L. Dulog (1981-1985)
Dr. G. C. Eastmond (1977-1985)
Prof. G. Hinrichsen (1977-1985)
Dr. H. H. Meyer (1983-1987)
Mr. P. Starck (1983-1987)

### Associate Members

Prof. Sir Geoffrey Allen (1979-1985)
Dr. B. C. Anderson (1983-1987)
Dr. J. W. Barrett (1981-1985)
Prof. G. W. Becker (1979-1985)
Prof. V. A. Kabanov (1981-1985)
Prof. J. C. Seferis (1983-1987)
Dr. A. J. de Vries (1977-1985)

### National Representatives

Prof. N. A. Ghanem (1981-1985)
  Arab Republic of Egypt
Prof. R. Qian (1981-1985)
  Chinese Chemical Society
Prof. J. Beniska (1981-1985)
  Czechoslovakia
Prof. H. Zimmermann (1983-1985)
  German Democratic Republic
Dr. T. Kelen (1979-1985)
  Hungary
Dr. I. S. Bhardwaj (1983-1985)
  India
Prof. M. Levy (1983-1985)
  Israel
Dr. A. Subramaniam (1983-1985)
  Malaysia
Dr. J. Majnusz (1983-1985)
  Poland

---

## WORKING PARTY ON MOLECULAR CHARACTERIZATION OF COMMERCIAL POLYMERS

Mr. P. Starck
  Chairman

### Members

Dr. W. Ball
Prof. H. Benoît
Dr. R. De Bruille
Mr. F. Canè
Dr. C. Cometto
Dr. D. Constantin
Dr. A. Holmström
Mr. W. Holtrup
Mr. L. J. Kulin
Dr. C. Leolini
Mr. N. L. J. Meyerink
Prof. B. Philipp
Dr. D. Roussel
Dr. Th. G. Scholte
Dr. C. Strazielle
Mr. S. Å. Sultan
Dr. M. Unbehend
Dr. J. L. Vidal
Dr. F. P. Warner

---

## WORKING PARTY ON STRUCTURE AND PROPERTIES OF COMMERCIAL POLYMERS

Dr. H. H. Meyer
  Chairman
Dr. D. R. Moore
  Secretary

### Members

Dr. G. Ajroldi
Prof. R. C. Armstrong
Dr. C. B. Bucknall
Mr. J. M. Cann
Dr. D. Constantin
Mr. H. Coster
Dr. M. Fleissner
Prof. H.-G. Fritz
Dr. P. H. Geil
Mr. A. Ghijsels
Dr. G. Goldbach
Dr. D. J. Groves
Dr. H. Janeschitz-Kriegl
Mr. P. B. Keating
Dr. H. M. Laun
Prof. A. S. Lodge
Dr. C. Macosko
Prof. J.Meissner
Dr. A. Plochocki

Dr. W. Retting
Dr. Richter
Dr. G. Schorsch
Dr. G. Schoukens
Prof. J. C. Seferis
Dr. J. M. Starita
Dr. G. Vassilatos
Prof. J. L. White
Prof. H. H. Winter
Mr. J. Young
Dr. H. G. Zachmann

## JAPANESE SUB-GROUP

Prof. A. Nakajima
Chairman

Members

Dr. S. Hayakawa
Dr. M. Kato
Dr. Y. Kubouchi
Dr. T. Masuda
Dr. T. Ono
Prof. J. Shimizu
Dr. M. Uchida
Dr. A. Yoshioka

## SUB-GROUP ON MOLECULAR THEORY

Members

Prof. R. C. Armstrong
Prof. A. S. Lodge
Prof. J. Meissner
Dr. M. H. Wagner
Prof. H. H. Winter

## SUB-GROUP ON THE CHARACTERIZATION AND ESTIMATION OF DEFECTS IN THE MOLECULAR STRUCTURE ON POLYVINYLCHLORIDE

Dr. A. Michel
Chairman

Members

Dr. Allsopp
Mme. V. Bellenger
Prof. D. Braun
Dr. Caraculacu
Dr. E. V. Dobrescu
Dr. Elgert
Dr. N. Fischer
Mme. Gallot
Dr. A. Guyot
Dr. C. J. M. van den Heuvel
Dr. P. Kappler
Dr. T. Kelen
Dr. Kolinsky
Mme. Llauro
Dr. Maddams
Dr. Millan
Dr. T. Nagy
Dr. Palma
Dr. Park
Dr. Quang Tho Pham
Dr. Simak
Dr. E. Sörvik
Dr. J. A. J. M. Vincent
Dr. H. O. Wirth
Dr. B. F. Witenhafer

## WORKING PARTY ON SUPPORTED POLYMER FILMS

Prof. L. Dulog
Chairman
Dr. J. Sickfeld
Secretary

Members

Dr. A. Berge
Dr. U. Biethan
Prof. D. Braun
Dr. M. Chiavarini
Mr. G. Christensen
Prof. D. T. Clark
Dr. G. P. Cunningham
Mr. P. H. Fink-Jensen
Mr. A. Fiorelli
Prof. W. Funke
Dr. A. C. Gerster
Mr. M. A. Glaser
Prof. K. Hamann
Dr. Ch. M. Hansen
Siv.ing. S. Heimdahl
Dr. P. Janssen
Dr. S. M. Kambanis
Dr. H. Kollek
Ir. M. F. Kooistra
Dr. H. J. Kretzschmar
Dr. J. A. W. van Laar
Mr. D. H. W. Lovegrove
Dr. H. J. Luthardt
Prof. R. R. Myers
Mr. H. K. Raaschou Nielsen
Dr. K. M. Oesterle
Dr. L. A. O'Neill
Dr. V. A. Ogarev
Prof. D. Pagani
Dr. P. E. Pierce
Dr. E. V. Schmid
Dr. D. H. Solomon
Dr. H. Spoor
Mr. A. R. H. Tawn
Dr. A. Toth
Mr. A. Toussaint
Dr. O. Vorster
Dr. U. Zorll
Mr. V. Zvonar

## SUB-GROUP ON SURFACE PROPERTIES OF FILMS AND FIBRES

Members

Dr. H. R. Anderson
Prof. C. Batich
Dr. D. J. Carlson
Dr. A. Dilks
Dr. R. Jeffries
Dr. D. Sheasley
Dr. H. Shonhorn
Dr. J. P. Sibilia
Dr. D. M. Soignet
Dr. D. W. Williams

## WORKING PARTY ON KINETIC PARAMETERS FOR FREE-RADICAL POLYMERIZATION

Dr. G. C. Eastmond
Chairman

Members

Prof. C. H. Bamford
Dr. A. Beresniewicz
Dr. K. Berger
Prof. J. C. Bevington
Prof. M. Kamachi
Prof. G. Meyerhoff
Prof. K. F. O'Driscoll
Prof. P. M. Reilly
Prof. P. Rempp
Prof. S. Russo
Dr. M. Stickler
Dr. Y. Y. Tan
Dr. P. Wittmer

## WORKING PARTY ON THERMAL PROPERTIES OF POLYMERS

Prof. G. Hinrichsen
Chairman

Members

Dr. J. M. Barton
Prof. R. F. Boyer
Dr. J. Chiu
Dr. P. Dantinne
Dr. M. Droesche
Dr. J. H. Flynn
Prof. P. D. Garn
Dr. G. Henze
Dr. K. H. Illers
Prof. H. Kambe
Prof. F. E. Karasz
Prof. A. Kettrup
Prof. J. J. Lindberg
Dr. T. R. Manley
Dr. E. Marti
Dr. V. B. F. Mathot
Mr. J. J. Maurer
Mr. J. M. O'Reilly
Dr. J. Paulik
Dr. J. M. Richardson
Dr. P. V. Ronca
Dr. J. P. Schelz
Dr. Edith A. Turi
Dr. I. Vancsó-Szmercsányi
Dr. J. Wendorff
Prof. B. Wunderlich

# ANALYTICAL CHEMISTRY DIVISION (V)

(Established 1949)

## DIVISION COMMITTEE

Prof. F. Pellerin (1975-1985)
President
Prof. G. H. Nancollas (1981-1985)
Vice-President
Prof. G. den Boef (1983-1987)
Secretary

### Members

Prof. J. F. Coetzee (1983-1987)
Prof. H. Freiser (1983-1987)
Prof. G. G. Guilbault (1983-1987)
Prof. Y. Marcus (1983-1987)
Prof. J. Robin (1983-1987)
Prof. G. Tölg (1983-1987)

### Coopted Members

Prof. J. Inczédy
Prof. J. W. Lorimer
Prof. A. Mizuike
Prof. B. F. Myasoedov
Prof. J. M. Ottaway

### Representative of FECS

Prof. E. Pungor

---

## COMMISSION ON ANALYTICAL REACTIONS AND REAGENTS (V.1)

(Established 1934)

### Titular Members

Prof. G. Ackermann (1977-1985)
Chairman
Prof. D. Thorburn Burns (1983-1987)
Secretary
Prof. S. B. Savvin (1979-1987)
Prof. L. Sommer (1983-1987)
Dr. W. I. Stephen (1977-1985)
Prof. E. V. Wänninen (1977-1985)

### Associate Members

Prof. G. Duyckaerts (1979-1987)
Prof. A. Hulanicki (1979-1987)
Prof. J. Inczédy (1983-1987)
Prof. F. Ingman (1979-1987)
Prof. D. L. Massart (1981-1985)
Prof. D. E. Ryan (1981-1985)
Prof. P. C. Uden (1981-1985)
Prof. K. Ueno (1981-1985)

### National Representatives

Prof. N. Jordanov (1979-1985)
Bulgaria
Prof. J. Garaj (1981-1985)
Czechoslovakia
Dr. W. M. Yong (1983-1985)
Malaysia
Dr. Brit Salbu (1982-1985)
Norway

---

## COMMISSION ON MICROCHEMICAL TECHNIQUES AND TRACE ANALYSIS (V.2)

(Established in its present form 1967)

### Titular Members

Dr. B. Griepink (1979-1987)
Chairman
Dr. A. Townshend (1977-1985)
Secretary
Prof. E. Jackwerth (1979-1987)
Dr. A. Lamotte (1983-1987)
Prof. Z. Marczenko (1981-1985)
Prof. Yu. A. Zolotov (1983-1987)

### Associate Members

Prof. K. Ballschmitter (1983-1987)
Prof. K. Beyermann (1981-1985)
Prof. R. Dams (1983-1987)
Prof. K. Fuwa (1981-1985)
Prof. M. Grasserbauer (1979-1987)
Dr. W. Gries (1983-1987)
Dr. K. Heinrich (1977-1985)
Prof. A. Mizuike (1981-1985)
Prof. J. M. Ottaway (1977-1985)
Prof. G. Tölg (1983-1987)
Dr. D. E. Wells (1983-1987)
Dr. D. G. Westmoreland (1983-1987)

### National Representatives

Prof. R. Gijbels (1983-1985)
Belgium
Prof. H. Thoma (1983-1985)
Brazil
Prof. J. Janák (1977-1985)
Czechoslovakia
Dr. Zsuzsa Horváth (1981-1985)
Hungary
Dr. M. Sankar Das (1983-1985)
India
Dr. R. C. H. Hsia (1983-1985)
Malaysia
Prof. A. D. Campbell (1976-1985)
New Zealand
Prof. W. Kemula (1979-1985)
Poland Prof. A. Cedergren (1981-1985)
Sweden

WORKING GROUP ON ORGANIC TRACE ANALYSIS

Dr. A. Lamotte
Chairman

Members

Prof. K. Ballschmitter
Prof. K. Beyermann
Prof. K. Biemann
Dr. B. Griepink
Dr. D. E. Wells
Dr. D. G. Westmoreland

WORKING GROUP ON SURFACE ANALYSIS

Prof. M. Grasserbauer
Chairman

Members

Dr. W. Gries
Dr. R. Hagemann
Dr. K. Heinrich
Prof. G. H. Morrison
Dr. Christiane Sénémaud

COMMISSION ON ANALYTICAL NOMENCLATURE (V.3)
(Established in its present form 1959)

Titular Members

Dr. G. Svehla (1975-1985)
Chairman
Prof. S. P. Perone (1977-1985)
Secretary
Prof. C. A. M. G. Cramers (1983-1987)
Prof. R. W. Frei (1979-1987)
Prof. R. E. Van Grieken (1983-1987)
Prof. D. Klockow (1981-1985)

Associate Members

Dr. L. Currie (1983-1987)
Dr. L. S. Ettre (1981-1985)
Dr. A. E. Fein (1981-1985)
Prof. H. Freiser (1981-1985)
Prof. G. G. Guilbault (1983-1987)
Dr. W. Horwitz (1981-1985)
Prof. B. R. Kowalski (1981-1985)
Dr. M. A. Leonard (1983-1987)
Dr. D. Leyden (1983-1987)
Prof. R. F. Martin (1981-1985)
Dr. B. Schreiber (1981-1985)
Prof. W. Simon (1983-1987)

National Representatives

Prof. I. Giolito (1983-1985)
Brazil
Prof. W. E. Harris (1980-1985)
Canada
Prof. J. Starý (1981-1985)
Czechoslovakia
Prof. R. H. Rosset (1981-1985)
France
Prof. K. Doerffel (1983-1985)
German Democratic Republic
Prof. E. Grushka (1981-1985)
Israel
Prof. H. M. N. H. Irving (1983-1985)
Republic of South Africa
Dr. D. Jagner (1981-1985)
Sweden

COMMISSION ON SPECTROCHEMICAL AND OTHER OPTICAL PROCEDURES FOR ANALYSIS (V.4)
(Established in its present form 1959)

Titular Members

Dr. A. Strasheim (1975-1985)
Chairman
Prof. K. Laqua (1975-1985)
Vice-Chairman
Dr. L. R. P. Butler (1983-1987)
Secretary
Dr. J. M. Mermet (1983-1987)
Dr. I. Rubeška (1977-1985)
Dr. Christiane Sénémaud (1983-1987)

Associate Members

Prof. C. Th. J. Alkemade (1975-1985)
Prof. H. Ebel (1981-1985)
Prof. G. M. Hieftje (1983-1987)
Prof. G. F. Kirkbright (1981-1985)
Prof. B. V. L'vov (1983-1987)
Prof. R. Manne (1981-1985)
Dr. W. H. Melhuish (1983-1987)
Dr. N. S. Nogar (1983-1987)
Prof. E. Plško (1977-1985)
Prof. J. Robin (1981-1985)
Dr. A. M. Ure (1981-1985)
Prof. M. Zander (1983-1987)

National Representatives

Dr. J. H. Cappacioli (1980-1985)
Argentina
Prof. A. J. Curtius (1983-1985)
Brazil
Prof. K. Zimmer (1979-1985)
Hungary
Dr. S. Shibata (1980-1985)
Japan
Dr. L. Pszonicki (1979-1985)
Poland

## COMISSSION ON ELECTROANALYTICAL CHEMISTRY (V.5)

(Established in its present form 1963)

### Titular Members

Prof. J. Jordan (1975-1985)
Chairman
Prof. K. Izutsu (1977-1985)
Secretary
Dr. A. K. Covington (1977-1985)
Dr. J. Juillard (1979-1987)
Prof. R. C. Kapoor (1977-1985)
Prof. E. Pungor (1979-1987)

### Associate Members

Dr. W. Davison (1981-1985)
Dr. R. A. Durst (1979-1987)
Prof. M. Gross (1979-1987)
Dr. K. M. Kadish (1979-1987)
Dr. R. Kalvoda (1977-1985)
Prof. H. Kao (1981-1985)
Prof. Y. Marcus (1979-1987)
Prof. T. Mussini (1979-1987)
Prof. H. W. Nürnberg (1979-1985)
Prof. M. Senda (1979-1987)
Dr. N. Tanaka (1979-1987)
Dr. Klára Tóth (1983-1987)

### National Representatives

Dr. D. D. Perrin (1971-1985)
Australia
Dr. B. Gilbert (1981-1985)
Belgium
Prof. W. C. Purdy (1979-1985)
Canada
Prof. H. Monien (1983-1985)
Federal Republic of Germany

France
Dr. G. Farsang (1983-1985)
Hungary
Prof. H. C. Gaur (1983-1985)
India
Dr. W. F. Smyth (1981-1985)
Ireland
Prof. E. Grushka (1981-1985)
Israel
Dr. W. Frankvoort (1983-1985)
Netherlands
Prof. Z. Galus (1979-1985)
Poland
Prof. G. Johansson (1981-1985)
Sweden
Dr. J. Buffle (1981-1985)
Switzerland
Dr. H. Thompson (1983-1985)
United Kingdom
Prof. Janet G. Osteryoung (1981-1985)
United States of America
Prof. I. Piljac (1983-1985)
Yugoslavia

---

## SUBCOMMITTEE ON ELECTROANALYTICAL METHODS OF ENVIRONMENTAL TRACE ANALYSIS

Prof. H. W. Nürnberg
Chairman

### Members

Dr. G. E. Batley
Dr. J. Buffle
Dr. R. A. Durst
Dr. R. Kalvoda
Prof. Janet G. Osteryoung
Prof. E. Pungor
Prof. S. Rubel
Dr. W. F. Smyth

---

## COMMISSION ON EQUILIBRIUM DATA (V.6)

(Established 1955)

### Titular Members

Prof. H. Ohtaki (1977-1985)
Chairman
Dr. L. D. Pettit (1979-1987)
Secretary
Prof. E. D. Goldberg (1981-1985)
Prof. I. Grenthe (1981-1985)
Dr. I. Nagypál (1983-1987)
Dr. P. Valenta (1981-1985)

### Associate Members

Prof. S. Ahrland (1983-1987)
Prof. G. Anderegg (1981-1985)
Dr. A. C. M. Bourg (1981-1985)
Dr. D. S. Gamble (1979-1987)
Dr. E. Högfeldt (1977-1985)
Prof. I. L. Khodakovskii (1983-1987)
Prof. W. A. E. McBryde (1981-1985)
Prof. G. H. Nancollas (1981-1985)
Prof. P. Paoletti (1983-1987)
Dr. D. D. Perrin (1981-1985)
Prof. D. G. Tuck (1983-1987)
Prof. O. Yamauchi (1981-1985)

### National Representatives

Dr. G. T. Hefter (1983-1985)
Australia
Prof. O. E. S. Godinho (1983-1985)
Brazil
Prof. M. T. Beck (1979-1985)
Hungary
Prof. A. Bylicki (1977-1985)
Poland
Prof. C. Luca (1981-1985)
Romania
Prof. I. N. Marov (1976-1985)
Union of Soviet Socialist Republics
Prof. G. R. Choppin (1983-1985)
United States of America

## SUBCOMMITTEE ON STABILITY CONSTANT DATA

Dr. L. D. Pettit
Chairman

Members

Prof. G. Anderegg
Prof. I. Grenthe
Dr. E. Högfeldt
Prof. I. L. Khodakovskii
Prof. W. A. E. McBryde
Dr. I. Nagypál
Prof. G. H. Nancollas
Prof. H. Ohtaki
Dr. D. D. Perrin
Dr. H. K. J. Powell
Prof. D. G. Tuck
Prof. O. Yamauchi

---

## COMMISSION ON ANALYTICAL RADIOCHEMISTRY AND NUCLEAR MATERIALS (V.7)

(Under Review)

---

## COMMISSION ON SOLUBILITY DATA (V.8)

(Established 1979)

Titular Members

Prof. A. S. Kertes (1979-1987)
Chairman
Dr. L. H. Gevantman (1983-1987)
Secretary
Prof. R. Battino (1983-1987)
Prof. H. L. Clever (1979-1987)
Prof. D. G. Shaw (1983-1987)
Dr. C. L. Young (1979-1987)

Associate Members

Prof. A. F. M. Barton (1983-1987)
Prof. R. Cohen-Adad (1979-1987)
Dr. P. G. T. Fogg (1983-1987)
Prof. F. W. Getzen (1979-1987)
Prof. W. Hayduk (1983-1987)
Prof. J. W. Lorimer (1983-1987)
Dr. A. N. Paruta (1981-1985)
Dr. M. Salomon (1983-1987)
Prof. P. W. Schindler (1979-1987)
Dr. A. Szafranski (1983-1987)
Prof. R. P. T. Tomkins (1983-1987)
Dr. S. H. Yalkowsky (1979-1987)

National Representatives

Prof. H. F. Aly (1983-1985)
Arab Republic of Egypt
Dr. R. Fernández-Prini (1980-1985)
Argentina
Dr. E. Wilhelm (1979-1985)
Austria
Dr. J. Vanderdeelen (1983-1985)
Belgium
Dr. Ch. Balarew (1980-1985)
Bulgaria
Prof. J. Fu (1983-1985)
Chinese Chemical Society
Dr. J. B. Jensen (1983-1985)
Denmark
Prof. B. A. Wolf (1980-1985)
Federal Republic of Germany
Dr. A. Vesala (1979-1985)
Finland
Dr. C. Treiner (1979-1985)
France
Dr. G. Jancsó (1980-1985)
Hungary
Prof. C. Kalidas (1979-1985)
India
Dr. I. Padova (1981-1985)
Israel
Prof. B. Scrosati (1980-1985)
Italy
Prof. H. Akaiwa (1980-1985)
Japan
Dr. K. H. Khoo (1983-1985)
Malaysia
Dr. G. A. Bowmaker (1980-1985)
New Zealand
Prof. H. Høiland (1981-1985)
Norway
Prof. A. Bylicki (1979-1985)
Poland
Prof. P. W. Linder (1981-1985)
Republic of South Africa
Prof. G. A. Yagodin (1979-1985)
Union of Soviet Socialist Republics
Dr. Mary Masson (1983-1985)
United Kingdom
Dr. J. D. Navratil (1981-1985)
United States of America

---

## SUBCOMMITTEE ON GAS SOLUBILITIES

Prof. H. L. Clever
Chairman

Members

Dr. R. W. Carling
Dr. Cynthia G. Carter
Dr. W. Gerrard
Dr. F. A. Lewis
Mr. D. M. Mason

---

## SUBCOMMITTEE ON LIQUID SOLUBILITIES

Prof. A. F. M. Barton
Chairman

Members

Dr. Marie-Claire Haulait-Pirson
Dr. G. T. Hefter
Dr. A. L. Horvath
Prof. P. Huyskens
Dr. Zofia Maczynska
Dr. A. Maczynski
Dr. A. Skrzecz
Prof. Joan D. Willey

---

SUBCOMMITTEE ON SOLID SOLUBILITIES

Dr. M. Salomon
Chairman

Members

Prof. M. T. Beck
Dr. Kathryn R. Bullock
Prof. C. Y. Chan
Dr. Marie-Thérèse Cohen-Adad
Prof. J. J. Counioux
Dr. W. Davison
Prof. T. P. Dirkse
Dr. Jitka Eysseltova
Prof. J. Fuger
Dr. C. Guminski
Dr. C. Hirayama
Dr. R. Kaliszan
Dr. I. Lambert
Dr. T. Mioduski
Prof. H. Miyamoto
Dr. R. Piekos
Dr. A. Regosz
Prof. S. Siekierski
Dr. J. A. Wood
Prof. E. M. Woolley

# APPLIED CHEMISTRY DIVISION (VI)

(Established 1949)

## DIVISION COMMITTEE

Dr. H. Frehse (1975-1985)
President
Dr. P. C. Kearney (1979-1985)
Vice-President
Dr. L. E. Coles (1981-1985)
Secretary

### Members

Dr. D. Firestone (1983-1987)
Prof. J. Holló (1981-1985)
Dr. Éva Kurucz (1981-1985)
Dipl.-Ing. K. Leichnitz (1983-1987)
Prof. M. Naudet (1981-1985)

### Coopted Members

Dr. H. Egan
Dr. S. Gorbach
Dr. R. Greenhalgh
Prof. K. Kojima
Mr. S. G. Luxon

## COMMISSION ON FOOD CHEMISTRY (VI.1)

(Established in its present form 1979)

### Titular Members

Dr. A. E. Pohland (1983-1987)
Chairman
Dr. P. S. Steyn (1979-1987)
Vice-Chairman
Dr. W. Krönert (1983-1987)
Secretary
Prof. G. Billek (1979-1985)
Prof. P. Krogh (1983-1987)
Dr. D. L. Park (1983-1987)

### Associate Members

Dr. R. Battaglia (1983-1987)
Prof. M. J. J. Castegnaro (1979-1987)
Prof. G. Grimmer (1979-1987)
Prof. M. Jemmali (1983-1987)
Prof. T. Juszkiewicz (1979-1987)
Dr. M. E. Knowles (1983-1987)
Dr. S. J. Kubacki (1983-1987)
Dr. H. A. M. G. Vaessen (1983-1987)

### National Representatives

Prof. M. M. Abdel Kader (1980-1985)
Arab Republic of Egypt
Dr. P. B. Czedik-Eysenberg (1977-1985)
Austria
Prof. J. Davídek (1976-1985)
Czechoslovakia
Dr. E. Lück (1975-1985)
Federal Republic of Germany
Dr. I. Rosenthal (1983-1985)
Israel
Dr. A. Cantafora (1977-1985)
Italy
Dr. T. Kato (1978-1985)
Japan
Dr. C. L. Lim (1983-1985)
Malaysia
Prof. A. Rutkowski (1975-1985)
Poland
Prof. C. Eriksson (1980-1985)
Sweden
Dr. L. E. Coles (1983-1985)
United Kingdom

## COMMISSION ON BIOTECHNOLOGY (VI.2)

(Established in its present form 1979)

### Titular Members

Prof. C. L. Cooney (1977-1985)
Chairman
Prof. M. Ringpfeil (1983-1987)
Vice-Chairman
Dr. G. G. Stewart (1983-1987)
Secretary
Prof. T. K. Ghose (1977-1985)

### Associate Members

Dr. P. P. Gray (1983-1987)
Prof. M. Linko (1983-1987)
Dr. R. C. Righelato (1983-1987)

### National Representatives

Dr. R. J. Ertola (1978-1985)
Argentina
Prof. H. J. G. Wutzel (1974-1985)
Austria
Prof. W. Borzani (1979-1985)
Brazil
Dr. B. Sikyta (1981-1985)
Czechoslovakia
Prof. K. von Meyenburg (1980-1985)
Denmark
Dr. L. Penasse (1983-1985)
France
Dr. V. Jagannathan (1983-1985)
India
Prof. L. Goldstein (1983-1985)
Israel

Prof. F. Parisi (1982-1985)
Italy
Prof. S. Fukui (1980-1985)
Japan
Dr. B. G. Yeoh (1983-1985)
Malaysia
Prof. E. Galas (1983-1985)
Poland
Prof. Vera Johanides (1981-1985)
Yugoslavia

---

COMMISSION ON OILS, FATS, AND DERIVATIVES (VI.3)
(Established in its present form 1977)

Titular Members

Prof. M. Naudet (1979-1985)
Chairman
Dr. A. Hautfenne (1977-1985)
Vice-Chairman
Mr. W. D. Pocklington (1983-1987)
Secretary
Dr. Ö. Levin (1977-1985)
Dr. J. Pokorný (1977-1985)
Prof. H. Wessels (1979-1985)

Associate Members

Dr. Joyce L. Beare-Rogers (1977-1985)
Dr. A. Dieffenbacher (1981-1985)
Prof. E. Fedeli (1981-1985)
Prof. J. Gracian-Tous (1979-1985)
Mlle. Brigitte Jacobsberg (1983-1987)
Drs. F. H. Koelman (1983-1987)
Dr. Éva Kurucz (1979-1985)
Dr. R. G. Manning (1983-1987)
Mr. A. T. Møller (1979-1985)
Dr. M. Teupel (1979-1985)
Mrs. Anneli Visapää (1981-1985)
Dr. G. Zwerenz (1981-1985)

National Representatives

Prof. A. M. Gad (1980-1985)
Arab Republic of Egypt
Dr. N. G. Bazan (1980-1985)
Argentina
Dr. A. R. Johnson (1976-1985)
Australia
Dr. Regina C. A. Lago (1979-1985)
Brazil
Dr. D. G. Chobanov (1975-1985)
Bulgaria
Dr. A. P. Tulloch (1980-1985)
Canada
Dr. Gunhild Hølmer (1981-1985)
Denmark
Dr. G. Ostermann (1981-1985)
Federal Republic of Germany
Prof. R. Linko (1981-1985)
Finland
Dr. J. P. Wolff (1979-1985)
France
Prof. V. M. Kapoulas (1977-1985)
Greece
Dr. N. V. Bringi (1981-1985)
India
Dr. Mary McCarthy (1981-1985)
Ireland
Dr. A. Dolev (1983-1985)
Israel
Prof. E. Tiscornia (1982-1985)
Italy
Dr. T. Hashimoto (1974-1985)
Japan
Prof. S. H. Ong (1983-1985)
Malaysia
Mr. P. W. Hendrikse (1973-1985)
Netherlands
Dr. F. B. Shorland (1971-1985)
New Zealand
Prof. W. Zwierzykowski (1978-1985)
Poland
Mr. G. D. Carr (1980-1985)
Republic of South Africa
Dr. Rodica Stoica (1981-1985)
Romania
Prof. M. Gassiot Matas (1981-1985)
Spain
Dr. R. Ohlson (1971-1985)
Sweden
Dr. H. Brüschweiler (1981-1985)
Switzerland
Miss Reyhan Perin (1981-1985)
Turkey
Dr. V. L. Rubajlo (1981-1985)
Union of Soviet Socialist Republics
Mr. A. E. Waltking (1979-1985)
United States of America

---

WORKING GROUPS OF COMMISSION ON OILS, FATS, AND DERIVATIVES

WG 8 - Identification and Determination of Emulsifiers Derived from Fatty Acids

H. Brüschweiler (Coordinator); T. Asahara, A. Dieffenbacher, Prof. A. M. Gad, H. Galenkamp, T. Hashimoto, Gunhild Hølmer, A. T. Møller, T. Nagaî, Mme. A. Solère, M. Teupel.

### WG 1/80 - Extension of Methods of Analysis for Fats and Oils to Analysis of Phospholipids

R. Ohlson (Coordinator); D. G. Chobanov, A. Dieffenbacher, H. Galenkamp, P. W. Hendrikse, Siew Wai Lin, Éva Kurucz, A. T. Møller, A. Nasner, A. Prévot, J. Pokorný, V. L. Rubajlo, Mme. A. Solère, Rodica Stoica, H. Wessels, G. Zwerenz.

### WG 2/80 - Determination of Insoluble Impurities in Phospholipids

Ö. Levin (Coordinator); T. Asahara, A. Dieffenbacher T. Hashimoto, Éva Kurucz, Siew Wai Lin, A. T. Møller, A. Nasner, M. Naudet, A. Prévot, J. Pokorný, Mme. A. Solère, A. E. Waltking, H. Wessels, G. Zwerenz.

### WG 3/80 - Qualitative and Quantitative Determination of Phospholipids

Joyce L. Beare-Rogers (Coordinator); T. Asahara, A. Dieffenbacher, E. Fedeli, J. Graille, T. Hashimoto, Gunhild Hølmer, Brigitte Jacobsberg, V. M. Kapoulas, Éva Kurucz, Siew Wai Lin, A. Nasner, M. Naudet, J. Pokorný, A. Prévot, Mme. A. Solère.

### WG 1/81 - Determination of Solvent Residue in Oilseed Cakes

J. P. Wolff (Coordinator); P. W. Hendrikse, Éva Kurucz, Siew Wai Lin, A. T. Møller, G. Ostermann, J. Pokorný, A. Prévot, D. Ribaillier, Mme. A. Solère, P. Vigneron, Members of D. G. F.

### WG 1/82 - Determination of Thiobarbituric Acid Value

J. Pokorný (Coordinator); H. Brüschweiler, A. Dieffenbacher, Brigitte Jacobsberg, Éva Kurucz, Siew Wai Lin, M. Naudet, M. Pike, W. D. Pocklington, H. Wessels, Mme. A. Solère.

### WG 1/83 - Determination of (n-3) Polyenoic Acids in Dietary Fats

Joyce L. Beare-Rogers (Coordinator); T. Asahara, J. Barruet, E. Fedeli, T. Hashimoto, Gunhild Hølmer, A. R. Johnson, Ö. Levin, Siew Wai Lin, R. Linko, R. Ohlson, W. D. Pocklington, A. Prévot, Mme. A. Solère, P. Vigneron, Anneli Visapää, A. E. Waltking, J. P. Wolff.

### WG 2/83 - Determination of Solvent Residue in Oil

J. P. Wolff (Coordinator); E. Fedeli, P. W. Hendrikse, A. Karleskind, Éva Kurucz, Siew Wai Lin, A. T. Møller, G. Ostermann, M. Pike, W. D. Pocklington, A. Prévot, D. Ribaillier, Mme. A. Solère, P. Vigneron.

### WG 3/83 - Determination of Butyric Acid

W. D. Pocklington (Coordinator); M. Adams, A. Dieffenbacher, D. Firestone, Prof. A. M. Gad, H. Galenkamp, J. Graille, P. W. Hendrikse, A. Karleskind, Regina C. A. Lago, M. Pike, Mme. A. Solère, R. Wood, Members of IOCC/AIOC and IDF Group E49.

### WG 4/83 - Determination of Tocopherols by HPLC

W. D. Pocklington (Coordinator); M. Adams, T. Asahara, Joyce L. Beare-Rogers, E. Fedeli, D. Firestone, J. Graille, T. Hashimoto, P. W. Hendrikse, Brigitte Jacobsberg, A. Karleskind, R. Ohlson, G. Ostermann, J. Pokorný, A. Prévot, Mme. A. Solère, M. Teupel, P.Vigneron, A. E. Waltking, J. P. Wolff.

### WG 5/83 - Determination of Traces of Metals by Direct Atomic Absorption Spectrometry

P. W. Hendrikse (Coordinator); J. Barruet, Joyce L. Beare-Rogers, D. G. Chobanov, A. Dieffenbacher, J. Dizier, H. Galenkamp, Brigitte Jacobsberg, A. R. Johnson, A. Karleskind, Éva Kurucz, Ö. Levin, A. T. Møller, R. Ohlson, M. Pike, J. Pokorný, A. Prévot, M. Teupel, P. Vigneron, Anneli Visapää, A. E. Waltking, J. P. Wolff.

## COMMISSION ON ATMOSPHERIC ENVIRONMENT (VI.4)

(Under Review)

---

## COMMISSION ON PESTICIDE CHEMISTRY (VI.5)

(Established in its present form 1979)

### Titular Members

Mr. J. A. R. Bates (1977-1985)
  Chairman
Dr. R. Greenhalgh (1975-1985)
  Secretary
Dr. N. Aharonson (1983-1987)
Dr. A. Ambrus (1983-1987)
Dr. S. Gorbach (1977-1985)
Dr. W. Klein (1983-1987)

### Associate Members

Dr. J. Desmoras (1977-1985)
Dr. H. O. Esser (1979-1987)
Dr. L. A. Golovleva (1983-1987)
Dr. R. J. Hemingway (1979-1987)
Dr. R. Hollingworth (1983-1987)
Dr. N. Kurihara (1983-1987)
Dr. N. Neely (1983-1987)
Dr. S. Otto (1983-1987)
Dr. T. R. Roberts (1979-1987)
Prof. J. Seiber (1983-1987)
Dr. D. B. Sharp (1983-1987)
Dr. J. W. Vonk (1977-1985)

### National Representatives

Dr. Ana Mariá Pechen de D'Angelo (1979-1985)
  Argentina
Dr. W. Lara (1983-1985)
  Brazil
Dr. Z. Lee (1983-1985)
  Chinese Chemical Society
Dr. J. Kovacicova (1983-1985)
  Czechoslovakia
Dr. F. Dutka (1979-1985)
  Hungary
Dr. S. K. Mukerjee (1983-1985)
  India
Dr. P. Bracha (1983-1985)
  Israel
Dr. C. K. Heng (1983-1985)
  Malaysia
Dr. G. W. Mason (1975-1985)
  New Zealand
Dr. A. Kotarski (1979-1985)
  Poland
Prof. N. Bǎrbulescu (1981-1985)
  Romania
Dr. P. C. Kearney (1983-1985)
  United States of America

---

## COMMISSION ON WATER QUALITY (VI.6)

(Under Review)

---

# CLINICAL CHEMISTRY DIVISION (VII)

(Established in its present form 1979)

## DIVISION COMMITTEE

Prof. F. W. Sunderman, Jr. (1979-1985)
President
Dr. S. S. Brown (1979-1985)
Vice-President
Prof. N. Montalbetti (1981-1985)
Secretary

### Members

Dr. A. Kallner (1981-1985)
Prof. Mirna Mikač-Dević (1981-1985)
Prof. K. Okuda (1981-1985)
Dr. V. N. Titov (1981-1985)
Prof. D. J. Vonderschmitt (1981-1985)

### Coopted Members

Prof. G. Férard
Dr. C. Franzini
Dr. G. Hoxter
Dr. K. S. Kasprzak
Dr. S. Nomoto
Dr. B. Ribas
Mr. J. C. Rigg
Prof. R. Vihko

### National Representatives

Dr. J. C. Connelly (1983-1985)
Australia
Prof. E. Kaiser (1969-1985)
Austria
Dr. C. K. Harris (1979-1985)
Canada
Dr. U. Worsaae (1975-1985)
Denmark
Prof. J. Breuer (1983-1985)
Federal Republic of Germany
Prof. J. C. Jardillier (1979-1985)
France
Dr. M. J. Talieri (1983-1985)
Greece
Dr. B. Ringelhann (1973-1985)
Hungary
Prof. M. Cais (1981-1985)
Israel
Prof. G. D'Ascenzo (1983-1985)
Italy
Prof. Y. Yamamura (1967-1985)
Japan
Dr. S. Landaas (1983-1985)
Norway
Prof. S. Angielski (1978-1985)
Poland
Prof. S. Lindstedt (1973-1985)
Sweden
Prof. V. N. Orekhovich (1967-1985)
Union of Soviet Socialist Republics
Prof. P. D. Griffiths (1979-1985)
United Kingdom

### Representatives of IFCC

Dr. R. Dybkaer
President
Dr. J. G. Hill
Secretary

### Representative of IUB

Prof. P. N. Campbell

---

## COMMISSION ON AUTOMATION AND CLINICAL CHEMICAL TECHNIQUES (VII.1)

(Established in its present form 1981)

### Titular Members

Prof. R. Haeckel (1981-1985)
Chairman
Dr. T. D. Geary (1983-1987)
Secretary
Prof. P. Bonini (1983-1987)
Dr. C. A. Burtis (1981-1985)

### Associate Members

Dr. J. Bierens de Haan (1983-1987)
Prof. J. Büttner (1981-1985)
Prof. M. Hjelm (1983-1987)
Dr. D. S. Young (1981-1985)

### National Representatives

Dr. R. D. Baillie (1981-1985)
Canada
Prof. P. Valdiguié (1981-1985)
France
Dr. V. Haviaras (1983-1985)
Greece
Prof. F. Salvatore (1981-1985)
Italy
Dr. Ch. Hayashi (1981-1985)
Japan
Mrs. Sissel Strand (1981-1985)
Norway
Dr. A. Hamfelt (1981-1985)
Sweden
Dr. N. Gochman (1981-1985)
United States of America

---

## COMMISSION ON QUANTITIES AND UNITS (VII.2)
(Established 1967)

### Titular Members

Dr. H. P. Lehmann (1979-1987)
Chairman
Dr. D. R. Bangham (1983-1987)
Prof. L. F. Bertello (1983-1987)
Dr. G. Férard (1983-1987)
Dr. B. F. Visser (1977-1985)

### Associate Members

Dr. R. Dybkaer (1977-1985)
Dr. C. Onkelinx (1983-1987)
Prof. O. Siggaard-Andersen (1983-1987)
Dr. U. Worsaae (1983-1987)
Dr. R. Zender (1981-1987)

### National Representatives

Dr. D. J. Campbell (1981-1985)
Canada
Prof. D. Stamm (1981-1985)
Federal Republic of Germany
Prof. B. Bousquet (1982-1985)
France
Dr. G. Sotiropoulou (1983-1985)
Greece
Prof. N. Montalbetti (1982-1985)
Italy
Prof. T. Horio (1981-1985)
Japan
Dr. O. P. Foss (1982-1985)
Norway
Prof. C.-H. de Verdier (1981-1985)
Sweden
Prof. P. D. Griffiths (1981-1985)
United Kingdom
Dr. C. A. Burtis (1981-1985)
United States of America

---

## COMMISSION ON TEACHING (VII.3)
(Established 1967)

### Titular Members

Dr. M. K. Schwartz (1975-1985)
Chairman
Dr. H. G. J. Worth (1979-1987)
Secretary
Dr. Nelly de Cediel (1983-1987)
Dr. C. G. Fraser (1981-1985)
Dr. O. Zinder (1979-1987)

### Associate Members

Dr. Jocelyn Hicks (1983-1987)
Prof. N. Montalbetti (1983-1987)
Dr. C. J. Porter (1983-1987)
Dr. M. Roth (1981-1985)
Prof. B. Štraus (1979-1987)
Dr. V. N. Titov (1981-1985)
Prof. R. Vihko (1981-1985)
Dr. C. W. H. Walker (1983-1987)

### National Representatives

Prof. M. M. Abdel Kader (1980-1985)
Arab Republic of Egypt
Dr. A. Gornall (1981-1985)
Canada
Prof. A. F. Delbrück (1981-1985)
Federal Republic of Germany
Prof. J. Agneray (1982-1985)
France
Dr. A. G. Hadjivassiliou (1983-1985)
Greece
Prof. R. Strom (1982-1985)
Italy
Prof. T. Kanno (1981-1985)
Japan
Dr. B. Christophersen (1981-1985)
Norway
Dr. B. Kågedal (1981-1985)
Sweden
Dr. H. A. Fritsche, Jr. (1981-1985)
United States of America

---

## COMMISSION ON TOXICOLOGY (VII.4)
(Established 1973)

### Titular Members

Prof. J. Savory (1977-1985)
Chairman
Prof. D. B. Tonks (1977-1985)
Secretary
Prof. Mirna Mikač-Dević (1981-1985)
Dr. E. Nieboer (1983-1987)
Dr. M. Stoeppler (1979-1985)

### Associate Members

Dr. A. Aitio (1983-1987)
Dr. K. S. Kasprzak (1981-1985)
Dr. K. Kühn (1981-1985)
Dr. S. Nomoto (1981-1985)
Prof. W. C. Purdy (1981-1985)
Dr. D. Shapcott (1983-1987)
Dr. Y. Thomassen (1981-1985)

### National Representatives

Dr. B. M. Kapur (1981-1985)
Canada
Prof. J. Büttner (1981-1985)
Federal Republic of Germany
Prof. C. Bohuon (1981-1985)
France
Mr. C. Kotsovassilis (1983-1985)
Greece
Dr. J. Borsy (1980-1985)
Hungary
Dr. W. King (1983-1985)
Ireland
Prof. F. Lodi (1983-1985)
Italy
Prof. T. Nambara (1980-1985)
Japan
Dr. W. A. Temple (1983-1985)
New Zealand

Dr. L. Daae (1980-1985)
Norway
Prof. B. Sörbo (1980-1985)
Sweden
Dr. P. I. Jatlow (1981-1985)
United States of America

### Representative of IUPHAR Section on Toxicology

Prof. G. Plaa

---

## SUBCOMMITTEE ON ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY OF NICKEL

Dr. E. Nieboer
Chairman

### Members

Dr. A. Aitio
Mr. I. Andersen
Prof. M. Anke
Dr. I. Balogh
Dr. M. Boysen
Mr. Ch. Bozec
Dr. S. S. Brown
Dr. D. D. Bryson
Dr. A. G. Cecutti
Dr. J. M. Christensen
Dr. M. Costa
Dr. D. Dewally
Dr. A. Dornemann
Dr. V. Eybl
Dr. R. Germain
Dr. Ph. Grandjean
Dr. K. Hansen
Dr. H. F. Hildebrand
Dr. A. Høgetveit
Dr. J. Järvisalo
Dr. K. S. Kasprzak
Dr. K. Kühn
Dr. E. Mastromatteo
Dr. Joan C. McEwan
Dr. J. Meininger
Prof. Mirna Mikač-Dević
Dr. L. G. Morgan
Dr. P. Mushak
Dr. R. de Neve
Dr. S. Nomoto
Dr. T. Norseth
Dr. J. Olafsson
Dr. A. K. Reith
Mr. B. R. Roy
Dr. G. Rubanyi
Dr. E. Sabbioni
Dr. B. Sarkar
Mrs. Geraldine Savory
Prof. J. Savory
Dr. K. H. Schaller
Dr. J. A. A. Sjöholm
Dr. R. M. Stern
Dr. M. Stoeppler
Prof. F. W. Sunderman, Jr.
Dr. F. W. Sunderman, Sr.
Dr. S. K. Tandon
Dr. H. Tjalve
Dr. Y. Thomassen
Prof. D. B. Tonks
Prof. D. R. Williams
Dr. H. Zachariasen

---

## SUBCOMMITTEE ON ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY OF CADMIUM

Dr. M. Stoeppler
Chairman
Dr. H. T. Delves
Secretary

### Members

Dr. J. Angerer
Dr. J. Aretz
Mr. M. Bédard
Mrs. E. Berman
Prof. P. De Bièvre
Dr. S. S. Brown
Dr. A. Buratti
Mrs. J. M. Christensen
Dr. A. Dornemann
Dr. V. Ebbighausen
Dr. U. Ewers
Dr. G. S. Fell
Dr. M. Fleischer
Dr. J. P. Franke
Prof. J. M. Frazier
Prof. S. Gomišček
Dr. R. Griffin
Mrs. C. Hadtzchristidis
Prof. J. M. Haguenoer
Dr. A. Harada
Dr. R. F. M. Herber
Dr. F. Hill
Mrs. V. Hudnik
Mr. Jakobi
Dr. J. Järvisalo
Dr. S. Khandelwal
Prof. Y. Kodama
Dr. P. Krause
Prof. R. Lauwerys
Mr. B. Lind
Prof. P. Lous
Prof. G. Machata
Dr. G. Mattiello
Mr. H. Muntau
Dr. R. de Neve
Dr. H. Nomiyama
Dr. S. Nomoto
Dr. H. Oldiges
Prof. J. M. Ottaway
Prof. H.-J. Pesch
Dr. J. M. Pujade-Renaud
Dr. D. A. Robbins
Prof. S. Rubel
Dr. K. H. Schaller
Mr. N. J. van Sittert
Mr. N. J. Smith
Dr. K. R. Sperling

Prof. W. Steuer
Dr. C. D. Strehlow
Dr. K. S. Subramanian
Prof. D. B. Tonks
Prof. J. Versieck
Prof. O. Vesterberg
Mrs. R. J. Ward
Dr. E. Weisenberg
Dr. W. C. M. Zwennis

---

## SUBCOMMITTEE ON TOXICOLOGY OF ALUMINIUM

Prof. J. Savory
Chairman

Members

Dr. A. C. Alfrey
Prof. P. Allain
Prof. A. Berlin
Dr. U. de Boni
Dr. E. Claiborne Irby
Prof. H. A. Das
Dr. J. P. Day
Dr. G. S. Fell
Dr. H. J. Gitelman
Dr. F. Y. Leung
Dr. D. R. C. McLach
Dr. H. Matusiewicz lan
Dr. Y. Mauras
Dr. E. Nieboer
Dr. B. Stevens
Dr. A. Taylor
Dr. M. K. Ward
Dr. M. R. Wills

---

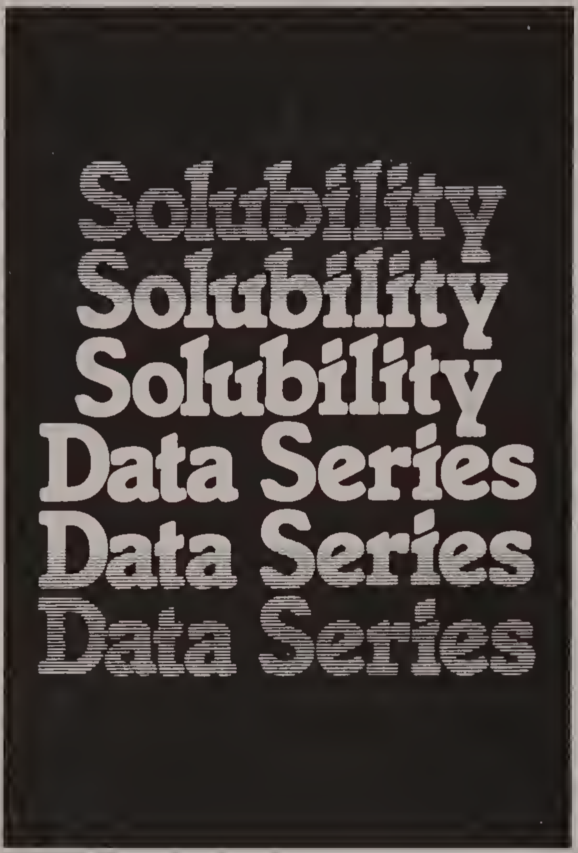
## SUBCOMMITTEE ON TOXICOLOGY OF SELENIUM

Dr. Y. Thomassen
Chaiman

Members

Dr. J. Aaseth
Dr. G. Alfthan
Dr. D. Behne
Prof. H. A. Das
Dr. H. T. Delves
Dr. R. M. Griffin
Dr. M. Ihnat
Dr. V. Iyengar
Dr. O. A. Levander
Prof. Mirna Mikač-Devic
Dr. J. Pikkarainen
Dr. Marion F. Robinson
Dr. M. Stoeppler
Dr. Christine D. Thomson
Dr. R. T. Tulley
Dr. C. Veillon
Dr. Marleen Verlinden
Dr. J. H. Watkinson
Dr. B. Welz
Dr. G. Q. Yang

---



Solubility
Solubility
Solubility
Data Series
Data Series
Data Series

## SOLUBILITY DATA SERIES

The IUPAC series of critically-evaluated solubility data covering all physical and biological systems

Editor-in-Chief: A S KERTES, *Hebrew University of Jerusalem, Israel*

The *Solubility Data Series* has become established as the most authoritative and comprehensive numerical work of reference ever published on the subject of solubility. The 100 volumes to be published over the next ten years will systematically cover every solid, liquid and gas for which experimental data have been published. Data are critically evaluated paying particular attention to purity of reagents, experimental techniques and estimated errors. This multidisciplinary reference set will be essential in all libraries which serve the information needs of researchers in chemistry, chemical engineering, biology, materials science, medicine, pharmacology, the geosciences and environmental sciences.

INDEPENDENT OPINION

"The series has no real competition and deals with a subject intensely relevant not only to chemistry, but to geophysics, pharmacology, and engineering. Major research libraries can hardly refuse to subscribe."
*Journal of the American Chemical Society*

**Subscription Information**

| | |
|---|---|
| Annual subscription (1984) | **US$1350.00** |
| Two-year rate (1984/85) | **US$2565.00** |

**Published so far**

1 Helium and Neon
2 Krypton, Xenon and Radon
3 Silver Azide, Cyanide, Cyanamides, Cyanate, Selenocyanate and Thiocyanate
4 Argon
5/6 Hydrogen and Deuterium (2 volumes priced at $200.00)
7 Oxygen and Ozone
8 Oxides of Nitrogen
9 Ethane
10 Nitrogen and Air
11 Alkali Metal, Alkaline-Earth Metal and Ammonium Halides. Amide Solvents
18 Tetraphenylborates

FORTHCOMING VOLUMES

Oxides of Sulfur; Hydrogen Halides in Non-Aqueous Solvents; Alkali Metal Halates; Lanthanide Nitrates; Methane; Carbon Dioxide; Halogenated Benzenes, Toluenes, Xylenes and Phenols; Aqueous Silver Chloride Systems; Copper, Silver and Gold Halates.

---

FREE SPECIMEN COPIES AVAILABLE ON REQUEST
Advertising rate card available on request. Back issues and current subscriptions are also available in microform. Prices are subject to change without notice. Journal prices include postage and insurance. Sterling prices are available to UK and Eire customers on request.

**Pergamon Press**

Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

5B/6 11.82

systems was discussed and will be further developed during the coming year.

**8.** Other topics considered mainly in meetings of various working groups included: revised nomenclature for radicals and ions; comprehensive nomenclature for natural products (revised Section F); comprehensive stereochemical nomenclature (revised section E); acid nomenclature; delocalized ions and radicals, and class names.

**9. Membership.**

Prof. D. Hellwinkel, Dr. W. H. Powell, Prof. O. Achmatowicz, Dr. A. D. McNaught, and Prof. J. C. Richer were reelected as Titular Members. Prof. P. A. S. Smith was elected as a Titular Member, replacing Dr. K. Hirayama who was elected as an Associate Member. Dr. K. Bláha, Mr. E. W. Godly, Prof. N. Lozac'h, Dr. O. Weissbach, and Mr. S. P. Klesney, were reelected as Associate Members. Dr. H. Gutmann, Prof. H. J. T. Bos, and Dr. P. M. Giles, Jr. were elected as Associate Members. Dr. J. R. Bull (South Africa), Prof. G. Mehta (India), and Prof. K. C. Chan (Malaysia) were approved formally as National Representatives.

**10.** The next meeting of Commission III.1 will be 29 July–4 August 1984, in Montreal, Canada.

**G. P. Moss**

## Commission V.2 — Microchemical Techniques and Trace Analysis: Lyngby, Denmark, 20–22 August 1983

**1. Membership**

Dr. Griepink was elected as Chairman until 1987. Dr. Townshend would continue as Secretary until 1985. Dr. Lamotte and Prof. Zolotov were elected as Titular Members until 1987. Prof. K. Biemann was elected exceptionally as a seventh Titular Member (see 3d). Profs. Tölg, K. Ballschmitter and R. Dams, and Drs. W. Gries, D. E. Wells and D. G. Westmoreland were elected as Associate Members until 1987. Prof. M. Grasserbauer was re-elected as an Associate Member until 1987. Prof. Adams had resigned as a National Representative, and was replaced by Prof. R. Gijbels. In addition, Prof. H. Thoma, Dr. C. H. Hsia and Dr. M. Shankar Das were confirmed as National Representatives until 1985.

**2. Reports completed**

(a) *Nomenclature, Symbols and Units Recommended for In-situ Microanalysis* (Grasserbauer, Heinrich and Morrison). The report was in press, as provisional recommendations. Comments received would be considered at the next meeting.

(b) *Separation and Preconcentration of Trace Substances. II. Precipitation of Major Constituents for Trace Preconcentration: Potential and Problems* (Jackwerth and Townshend). Preparation of the manuscript would be completed by Dr. Townshend, for circulation to several members, for comments, before circulation to the Division Committee.

(c) *General Aspects of Trace Analytical Methods.*

*VI. Acid Pressure Decomposition in Trace Element Analysis* (Jackwerth and Gomisćek). This had been submitted to the Division Committee. Comments by Prof. Nürnberg were considered, and the final report approved for publication.

(d) *Critical Evaluation of Analytical Methods for the Determination of Trace Elements in Various Matrices.*

*I. Selenium in Biological Materials and Water* (Campbell). The report had been submitted to the Division Committee. A suggestion by Prof. Nürnberg that it await publication with the Divisional Project reports was rejected. The report was approved for publication.

*II. Cobalt in Biological Materials* (Townshend). A revised report was approved for submission to the Division Committee.

*III. Molybdenum in Biological Materials* (Marczenko). Dr. Townshend would edit the report, and submit it to the Division Committee.

*IV. Chromium in Biological Materials* (Ottaway). After slight amendment, the report would be submitted to the Division Committee.

(e) Divisional Project

*Some General Considerations Concerning Accuracy and Precision in Trace Metal Analysis in Water* (Griepink).

*Investigation of Methods and Sources of Error in Trace Element Analysis in Surface Waters using the Determination of Chromium and Mercury as Examples.*

Both reports had been submitted to the Division Committee. Prof. Nürnberg wished to retain both reports until the Division Project reports were published. However, it was agreed with Prof. Nürnberg that the reports would first be published in PAC, but could also be incorporated in the Divisional Project documentation at a later stage, updated if necessary. Prof. Nürnberg undertook to inform the Division Secretary of these arrangements; he also indicated the possibility of the Divisional Project being extended to biological samples.

(f) *Separation and Preconcentration of Trace Substances. IV. A New Type of Preconcentration of Trace Elements: Interphase Collection (Flotation) of Ion-Associates of Multivalent Anionic Complexes of Platinum Metals with Basic Dyes* (Marczenko). A revised report was presented. It was agreed that the report, although specialized, should be submitted to the Division Committee, after editing.

**3. Current projects**

(a) Critical Evaluation of Analytical Methods for the Determination of Trace Elements in Various Matrices.

V. Thallium in Various Matrices (1979), Tölg).

A report was available in German. Dr. Griepink agreed to translate it, and send it to Dr. Townshend for editing.

(VI). Nickel in Biological Materials (1979, Townshend).

In view of the extensive literature produced by Commission VII, this project was terminated.

VI. Trace Analysis of Semiconductor Materials (1981): Part A. Bulk Analysis (Zolotov, Yu. A.

Karpov). Part B. Distribution Analysis (Grasserbauer, Morrison and G. Stingeder).

Draft reports were presented. Members should have sent their comments to the Secretary by 1 December 1983.

VII. Manganese in Biological Materials (1981, Ottaway).

No progress reported.

VIII. Fluorine in Various Matrices (1982, Campbell).

An outline of the project was presented. A draft report would be available before the next meeting.

(b) Instrumental Methods of Organic Elemental Analysis (1978, Griepink, Lamotte, Terent'eva).

The position paper by Dr. Lamotte was discussed. It was decided that it was preferable to concentrate on organic trace analysis (3d), thus the project was terminated.

(c) Standards and Calibration Methods for Surface Analysis I. Semiconductors (1981, Grasserbauer, Morrison, Gries, Heinrich, Hagemann).

The title of the project was revised. The project will give information on available standards, accepted methods of production, and a critical evaluation of calibration procedures. The review date is 1985. Further reports would consider metals, glasses, ceramics and compound materials.

(d) Organic Trace Analysis

There was considerable discussion of the need to establish rapidly a powerful working Group in this area. Dr. Lamotte's position paper had indicated a number of important areas that demanded urgent attention, and the Commission was very aware of the limited expertise amongst its current membership. Because of the urgency of the situation, therefore, it was decided not only to promote Dr. Lamotte to Titular Membership, but to ask, exceptionally, for a seventh Titular Member (Prof. K. Biemann) to lead this project. Dr. Westmoreland and Dr. Wells were adopted as Associate Members to serve with this Working Group, and Drs. Janak and Griepink would also be members. Dr. Westmoreland would write to Dr. Lamotte informing him of the details of the discussion.

Dr. Lamotte would initially coordinate activity, and would establish priority areas and projects in collaboration with the Working Group. It was agreed that a meeting of the Working Group, probably in Brussel in Spring 1984, would have first call on Commission Funds. Such initial planning should be completed by June 1984.

(e) Survey of Decomposition Methods in Elemental Trace Analysis (1980, Griepink).

Dr. Griepink presented an outline of the project. Members are invited to contribute any ideas about this project to Dr. Griepink, so that a first full draft can be discussed at the next meeting. The report will concentrate on

**Commission V.2, Lyngby, Denmark, August 1983.**
**From left to right: A. Mizuike, unknown NR, A. Townshend, Yu. A. Zolotov, M. Grasserbauer, G. Tölg, A. Cedergren, D. G. Westmoreland, A. D. Campbell, G. H. Morrison, E. Jackwerth, B. Griepink, Z. Marczenko.**

new techniques, with examples, and will stress important implications for ultratrace analysis.

**4. New projects**

(a) Separation and Preconcentration of Trace Substances.

Profs. Jackwerth, Mizuike and Zolotov had considered future projects in this area, and recommended the following as the most urgent.

V. Microscale Preconcentration Techniques for Trace Analysis (Mizuike, Tölg, Zolotov). A first report would be ready in 1985.

VI. Aspects of Combination of Preconcentration and Determination in Trace Analysis (Tölg, Zolotov). A first draft would be available before the 1984 meeting of the Commission.

(b) Critical Evaluation of Analytical Methods for the Determination of Trace Elements in Various Matrices.

IX. Aluminium in Biological Materials (Cedergren).

There would be collaboration with Commission VII.4. A first report would be available before the next meeting.

(c) Reference Materials for Trace Analysis (Griepink).

This project will deal with definitions of reference materials (r.ms); demands posed on r.ms; the manufacture, homogeneity and stability of r.ms; certification procedures; and applications of r.ms.

(d) Speciation

This was identified as the next priority area, and would be considered in more detail when the Trace Organic Analysis Working Group was firmly established.

**5. Joint meetings**

(a) Commission on Toxicology (VII.4)

It was confirmed that there was no detailed duplication between the projects of the Commission, in connection with trace metal determinations in biological materials, and that there was a full exchange of information between the Commissions. Fears that Commission V.2. would "recommend" a different method to Commission VII.4 were allayed, in that V.2. was obliged to comment on a wide range of techniques and methods, whereas VII.4 experimentally evaluated very detailed procedures, and necessarily had to provide a recommended method. The legal connotation of "reference" and "recommended" methods was discussed at length, and it was concluded that IUPAC "recommendations" had no legal status. Finally, it was stressed that the ultimate goal of VII.4 was to obtain toxicological information, not just to develop analytical procedures. This contrasted with the aims of the Analytical Commissions. It was agreed to continue collaboration by exchange of minutes and other relevant information, and to cooperate in projects of joint interest, as before. No progress was likely from VII.4 in *organic* trace analysis in the near future.

(b) Commission on Electroanalytical Chemistry (V.5)

Both Commissions surveyed their on-going programmes. The project on Ion-chromatography had not begun. Prof. Marcus had provided Prof. Grushka with a detailed outline of the project, but this had produced no response. Prof. Marcus would make a final attempt to stimulate Prof. Grushka into action, but if this failed, Prof. Marcus would ask Prof. Zolotov to write the position paper.

**Next meeting**

This is likely to be at Euroanalysis V, at Cracow, Poland, 26–31 August 1984. Financial assistance for Titular Members will probably be extremely limited, but it is hoped as many Members as possible will be able to attend.

**A. Townshend**

## Commission VII.2 — Quantities and Units in Clinical Chemistry: Lyngby, Denmark, 19–22 August 1983

1. Provisional minutes of Commission meeting held in Maastricht, The Netherlands, 21–23 March 1983 were approved.

2. Commission VII.2's programmes and projects were reviewed in the light of the May 1983 Critical Assessment Report of the Vice-President of IUPAC. Goals, objectives and tasks for the Commission were drawn up, and updated reports on all projects prepared on the appropriate IUPAC forms for approval by the Clinical Chemistry Division Committee (CCD).

3. Status Reports and review of Projects

3.1 Quantities and Units in Clinical Chemistry (QUCC): Nebulizer and Flame Properties in Flame Emission and Absorption Spectrometry: stage 2, draft 2 document, approved by CCD on 18 August 1983, to be submitted to IDCNS for review and consideration as a IUPAC recommendation.

3.2 Nomenclature of Derived Quantities: stage 2, draft 3 document, approved by CCD on 18 August 1983, to be submitted to IDCNS for review and consideration as a IUPAC recommendation.

3.3 Physico-Chemical Quantities and Units in Clinical Chemistry with Special Emphasis on Activities and Activity Coefficients: stage 3, draft 1 document submitted for CCD review on 22 July 1983 with a view to publication as a IUPAC recommendation.

3.4 Definitions, Symbols, Quantities and Units in Optical Spectroscopy: draft document prepared in conjunction with Commission I.5 reviewed at a joint meeting with Commission I.5. Revised draft to be prepared for submission to Divisions I and VII for review and approval with a view to publication as a IUPAC recommendation.

3.5 QUCC: Quantities and Units Related to Change in Properties with Time: project redefined, retitled to 'Quantities and Units for Metabolic Processes as a Function of Time', and new objectives prepared.

3.6 QUCC: A Special Unit for the Quantity: Number of Entities: plans were drawn up to prepare a petition to be presented through IDCNS to the Consultative Committee for Units of the International Committee for Weights and Measures for the proposal to use a special unit and symbol for the quantity 'number of entities'.

4. A new Commission VII.2 project 'Classification, Quantities and Units for Binding Assays' was proposed, discussed, and objectives drawn up for submission for approval by CCD.

5. A joint meeting was held with Commission V.4 and projects of mutual interest reviewed. Of particular interest to Commission VII.2 is the document *Nomenclature, Symbols, Units and their Usage in Spectrochemical Analysis. Part VII. Molecular Absorption Spectroscopy (UV/VIS).*

6. Membership: the following nominations were made for membership of CQUCC:

Titular Members 1983–1987:
H. P. Lehmann, D. Bangham, L. F. Bertello, G. Ferard.
Associate Members 1983–1987:
C. Onkelink, J. C. Rigg, O. Siggaard-Andersen.

7. Future meetings: March 1984, London, U.K. (IFCC/EPQU)
October/November 1984, site to be decided (IUPAC/CQUCC).

**H. P. Lehmann**

## Corrections

On p. 60 of CI, 1983, No. 5 the first publication of the proposed nomenclature for hydrogen recommended by Commission III.2 appeared. Unfortunately there were three typographical errors:

Table heading: "isotropic" should read "isotopic";

Table, first column, 2nd entry: "hydro" should read "hydron";

Table, last column, 5th entry: "tritionation" should read "tritonation".

We apologise for these errors and hope that publication of these corrections will be in time to prevent the use of incorrect nomenclature.

# IUPAC-SPONSORED CONFERENCES

Details of more of the 1984 IUPAC-sponsored Conferences are given below; further information may be obtained from the relevant organizers, see p. 61. May I repeat my appeal for organizers to send me full details of their Conferences as early as possible so that these can be published in good time for the information of intending participants.

### **12th International Carbohydrate Symposium,** Utrecht, Netherlands, 1–7 July 1984

The Symposium will take place in the Utrecht Jaarbeurs Congress Centre, which is part of the Royal Netherlands Industries Fair. The Centre is connected by covered walkways with Utrecht Central Railway Station; if you will be travelling by air, Utrecht has a direct KLM bus service with Schiphol (Amsterdam) Airport.

The scientific programme has been designed to cover the broad field of chemistry, biochemistry, technology and biotechnology of carbohydrates. It will include plenary lectures, invited lectures and communications presented orally or as posters. The invited lectures and communications will be delivered in four parallel sessions corresponding to the four main themes of the Symposium —

Synthesis in relation to carbohydrates
Carbohydrates in industry
Biochemical and medical aspects of carbohydrates and glycoconjugates
Structural and conformational aspects of (poly)saccharides and glycoconjugates.

*Invited lectures* on these four themes will be given, respectively, by: J. S. Brimacombe (UK), A. Gomez Sanchez (Spain), F. W. Lichtenthaler (FRG), A. Liptak (Hungary), P. Sinay (France), K. Tatsuta (Japan).

R. Muzzarelli (Italy), W. Pilnik (Netherlands), J. A. Roels (Netherlands), E. Sjöström (Finland).

T. Feizi (UK), K. A. Karlsson (Sweden), Y. C. Lee (USA), Y. T. Li (USA), M. Monsigny (France), H. Schachter (Canada).

P. Albersheim (USA), E. D. T. Atkins (UK), K. Bock (Denmark), A. Dell (UK), H. van Halbeek (Netherlands), R. K. Yu (USA), E. Romanowska (Poland).

*Plenary lectures* to be given are:

Structural analysis of blood group ABH, i, I, Lewis and related glycosphingolipids. Application of high resolution NMR and FAB mass spectrometry techniques (H. Egge, FRG).

Some aspects of regio-, stereo-, and chemoselective reactions in carbohydrate chemistry (P. G. Garegg, Sweden).
Structure, conformation, and immunology of the polysaccharide capsules of human pathogenic bacteria (H. J. Jennings, Canada).
Chemistry and new uses of sucrose: How important? (R. A. Khan, UK).
The sugar chains of γ-glutamyltranspeptidase: Structures, organ- and species-specific differences, changes by malignant transformation and their application for hepatoma diagnosis (A. Kobata, Japan).
Synthesis of building blocks of bacterial polysaccharides and its application for preparation of synthetic antigens (N. K. Kochetkov, USSR).
Spatial structures of glycan chains of glycoproteins in relation to metabolism and function (J. Montreuil, France).
Synthetic approaches to glycan chains (T. Ogawa, Japan).
Selection of influenza virus variants based on sialyloligosaccharide receptor specificity (J. C. Paulson, USA).
Microbiopolysaccharides: new products and their commercial application (P. A. Sandford, USA).
The anti-recognition function of sialic acids: Studies with erythrocytes and macrophages (R. Schauer, FRG).

**Old Academic Building, State University of Utrecht (photo courtesy of Rijksuniversiteit Utrecht).**

Utrecht is a city with about 230 000 inhabitants. Besides the old inner town with its narrow winding canals, its unique dockyard cellars, its churches, the university buildings and various museums, Utrecht possesses one of Europe's largest and most modern undercover shopping centres, 'Hoog-Catharijne'. The State University of Utrecht, founded in 1636, is the largest in The Netherlands.

Applications for registration and hotel accommodation and submission of abstracts should be made by 15 March 1984.

## **10th IUPAC Symposium on Photochemistry,** Interlaken, Switzerland, 22–27 July 1984

The Symposium will be held at the Congress-Center Casino Interlaken (CCCI) which is within walking distance of all hotels and pensions of Interlaken.

The scientific programme will include 15 plenary lectures, about 10 short (20 min) oral presentations, and contributed papers to be exhibited as posters throughout the conference. Additionally there will be at least one workshop on laser photochemistry and its applications.

*Plenary lectures* to be given are:
Phytochemistry — Photochemistry of light-responsive plant growth pigments (S. Braslavsky, FRG).
Photochemical reactions of exciplexes (R. Caldwell, USA).
Chemiluminescence — Chemical generation of excited states in biological systems (G. Cilento, Brazil).
Electron transfer induced photofragmentation reactions (D. Eaton, USA).
Photochemical electron transfer reactions of olefins (S. Farid, USA).
Applications of photochemistry: Progress and projections (G. S. Hammond, USA).
Photochemistry of radical ions (E. Haselbach, Switzerland).
Pulse radiolytic generation of electronic excited states (A. Henglein, FRG).
Useful photocycloaddition reactions (W. H. Laarhoven, Netherlands).
Theoretical applications of photochemistry (J.-P. Malrieu, France).
Picosecond study of photodynamics (N. Mataga, Japan).
Practical applications of photoreactions mimicking photosynthesis (S. Tazuke, Japan).
Photodepolymerization processes (G. Willson, USA).
Applications of photochemistry in the study of polymer dynamics (M. Winnik, Canada).
Conjugated biradicals in photochemistry (J. Wirz, Switzerland).

# CHEMRAWN — especially CHEMRAWN III

There may even be a few people within IUPAC who do not know what CHEMRAWN stands for and there must be many outside the Union. For those people, it is derived from the title of a major IUPAC project — CHEMical Research Applied to World Needs. This project really got under way in 1975 when a committee was established to plan an international conference whose purpose was to establish the role that chemistry and chemical engineering could play in benefiting mankind, and to bring this to the attention of politicians, economists and educationalists. The hope was that, by taking into account social, economic and environmental factors as well as the purely technological approach, an assembly of the world's eminent scientists and decision makers from governments, industries and universities, from both developed and developing countries, could develop a programme of chemical research priorities.

The first CHEMRAWN conference (Toronto, Canada) took place in 1978, at a time when it was abundantly clear that the supply of oil was not inexhaustible and alternative sources of hydrocarbons appeared to be of vital importance. CHEMRAWN I dealt with future sources of organic raw materials and considered future energy sources such as non-conventional fossil hydrocarbons, the use of waste streams and renewable resources (e.g. plant materials). Recommendations were drawn up for development of suitable alternatives by the end of the century.

CHEMRAWN II (International Conference on Chemistry and World Food Supplies — The New Frontiers) was held in Manila, Philippines, in 1982 (CI 1983, No. 1, pp. 26–29). Once again the conference was aimed at the national decision makers so that the enormous problem of increasing food production could be attacked by research and development appropriate for each individual environment. A Future Actions Committee worked throughout the conference, refining and amending its recommendations as points were made, and finally produced a report with 17 recommendations, long-term on research on genetic engineering, plant physiology, nitrogen fertilizers, photosynthesis, and shorter-term on research on soils, crops, pests, animal production systems, food processing systems, and on educational requirements.

Dr. B. W. Rossiter, Chairman, CHEMRAWN Committee

The Proceedings of both these conferences have been published by Pergamon Press and a Perspectives and Recommendations booklet (CHEMRAWN II) in the Philippines.

CHEMRAWN III, the World Conference on Resource Material Conversion, will be held in The Hague, Netherlands, 25–29 June 1984. This third conference will complement the previous two, extending the line of thought from raw material supply (I) and world food supply (II) to the technological ability to convert raw materials into products. It will discuss new chemical routes using existing techniques and identify feasible but not yet developed technology. It will suggest a research programme to develop required chemical conversions with particular attention being paid to the options available for developing countries with different indigenous raw materials.

The conference is to be divided into five working sessions on a developing theme. These are:

*Resources:* the availability of major resources (coal, oil, gas, renewables) and their use as raw materials for production of chemicals or as energy sources will be discussed.;

*Resource to base chemicals* will be concerned with resource and routing dilemmas and the contributions of biotechnology and new forms of catalysis to economic production, particular emphasis being placed on the efficient utilization of enzymes.

*Base chemicals to end products* — the growing use of non-metals, protection from corrosion, fibre reinforcement, materials for high temperature use and large-scale vs small-scale production.

*Resubstitution,* the fourth session, will be concerned with ideas for alternative products, available or feasible, with special reference to rubbers, textiles and films.

*Loss prevention* will consist of the examination of the possibilities and problems of recycling. The most important aspects of the economics of loss prevention measures will be presented as a basis for discussion between industrial and governmental policy makers.

The conference fee will be about f700. See p.61 for the address to which to write for further details.

CHEMRAWN IV — Chemistry and Resources of the Global Ocean will be held at Woods Hole, Massachusetts, USA, 22–28 September 1985. The oceanic chemical processes, cycles and resources important to mankind will be reviewed, much of the conference being concerned with the current status of oceanic research.

---

# RECENT REPORTS

## Results of a collaborative study on the determination of erucic acid

Some countries restrict by legislation the proportion of docosenoic acids (C 22:1) in the total fatty acids of edible fat and oil products. A limit is also advocated by a Joint Expert Group of the Food and Agricultural Organisation and the World Health Organisation for those populations in which fat constitutes a high portion of dietary energy.

The two basic sources of docosenoic acids in edible fats and oils are rapeseed oil and partially hydrogenated marine oil which are used to a large extent in the European fats and oils industry. Whereas in marine oils cetoleic acid (*cis*-11-docosenoic acid) predominates among the docosenoic acids, rapeseed oil contains erucic acid (*cis*-13-docosenoic acid) only. By the breeding of new rapeseed varieties the erucic acid content of rapeseed oil has been reduced from about 47% to less than 3%. In most European countries and in Canada only these new varieties are grown for the production of edible oils. By partial hydrogenation of both oils geometrical (*trans*)isomers as well as new positional isomers are formed. Total docosenoic acid can be determined using conventional GLC procedures for the separation of the fatty acid methyl esters.

In the European Economic Community (EEC) the amount of erucic acid in edible fats and oils and in compound foodstuffs to which fats and oils have been added has been limited to 5%. From the corresponding erucic acid directive specific analytical problems arise since it limits the amount of erucic acid but not of total docosenoic acid. Thus it is important for an analytical method to be available which distinguishes between erucic acid and other positional and geometrical docosenoic acid isomers that may be present. For the specific determination of erucic acid in the presence of other docosenoic acid isomers, procedures based on capillary GLC or on a combination of TLC and GLC have been developed. The combined TLC/GLC method was adopted as the official EEC-method in 1980.

The EEC procedure was collaboratively studied by the IUPAC Commission on Oils, Fats and Derivatives. The procedure provides first for a TLC separation of the methyl esters of the component fatty acids. Separation is carried out using argentation-TLC at low temperature (about –22°C). Under the conditions used erucic acid is separated from cetoleic acid and from *trans* docosenoic acid isomers. After addition of an internal standard the fraction containing erucic acid and the fraction containing all of the other fatty acids are eluted and analysed by GLC. The percentage of erucic acid is calculated from the erucic acid content of the erucic acid fraction and from the ratio of the internal standard in both fractions.

The Commission decided to adopt the method, the full text of which (Method 2.311) was published in PAC, Vol. 54, pp. 2760–2763 (1982). The results of the collaborative study will be published in the same journal in February or March 1984.

# Tradition! Full Stop

## by Prof. Rubin Battino
## Commission V. 8

*The scene is a courtroom with three judges sitting behind a high bench. The judges are the editors of three different scientific journals — The International Journal of Desalination (IJD), The Journal of Aqueous Chemistry (JAC), and the Physical Chemistry Journal (PCJ). Before them stands a perplexed and harassed author.*

Author: I've been trying for six years to get my paper published. The reviewers all say that the scientific work is good, that the data are of high quality, and that my conclusions are justified. Why can't I get it published?

IJD: Well, speaking for my journal, let me say that we agree with the reviewers' judgements in the technical sense. However, your work is not directly related to desalination. Your paper belongs in PCJ since it is really physical chemistry.

Author: I tried them. I really did. I completely rewrote the manuscript so that the references matched the PCJ form. I even redid the figures. The entire paper was retyped on 8½ × 11 white bond.

PCJ: You say you matched our requirements, but I had to send it back to you twice for editorial changes. You know we use eqn and not eq for equation. Yes, Yes, JAC, I know you use it as eqn., but you are wrong. The full stop is not needed.

JAC: Oh, yes it is! Without the full stop it is not possible to differentiate. We have always used the full stop. That is our tradition.

Chorus: [All three editors sing] Tradition.

Author: You may have your traditions, but I still have valid research to publish. Who cares about a full stop more or less? It is the science which counts.

PCJ: Oh, no, there you are wrong. We are communication specialists. We are editors. We know the language and how to use it exactly. You may know science, give us the credit for knowing how to write.

Author: Sure, sure. Maybe you can write better than me, but what does a full stop have to do with communication? As a scientist e–q, e–q–., e–q–n, e–q–n–., and even the full word equation, I read as "equation". It makes no difference to me or my colleagues which way it is written. *We* can make sense out of it.

JAC: You're wrong! It does make a difference. Editorial style is everything. Style is what distinguishes the intellectual from the ignorant, the asthete from the boor, the noble from the base, the...

Author: Stop, stop! You're driving me mad. Style may be important to you, it is nonsense to me.

Chorus: Nonsense! No! It is Tradition.

Author: Okay, okay, I believe you. I have traditions, too. [Murmurs of appreciation.] But, I am still concerned about promotion and reputation, and that means publications. After I put in all those crazy changes the PCJ wanted, you kept the manuscript for three months and then rejected it because you thought it was more aqueous solutions than physical chemistry. So, I just put it in another envelope and mailed it off to JAC.

JAC: And, of course, I mailed it right back to with a set of our instructions to authors.

Author: No, you didn't! It took you a month to return it. The manuscript had to be completely retyped to *your* specifications. You want inclusive pages *and* full titles for all references. That took two months to do.

JAC: And, of course, I mailed it back because you didn't put the reference citations in the text as superscript parentheses inside a period if at the end of a sentence. I see too many manuscripts to put those changes in. It is our tradition [Tradition by chorus] to have the authors do the work.

IJD & PCJ: Hear! Hear!

Author: I tried. I really tried, and we got all those damned things straightened out only to have you reject it in three months.

JAC: That's right, it is really a desalination paper.

IJD: That's not true. It's really aqueous chemistry or physical chemistry.

JAC & PCJ: No! No! Take it. It's yours.

IJD: Okay. I will. But he has to rewrite the paper in our traditional format.

Author: What do you mean traditional? Your journal only started two years ago.

IJD: Old or new, we still have our traditions.

Author: Look. I've got this simple, rational, and very practical idea. Why don't all you scientific and technical editors get together and decide on *one* format for papers. Decide on eq or eq. or eqn. Decide on how to treat citations in the text. Decide on numbering systems — arabic, roman, or what have you — for tables and figures. And please, please decide on one single format for references. This makes sense, doesn't it? You'll do it, won't you?

PCJ: That's a good idea. Why don't we try it. Now, if you'd all just adopt my system, there would be no problem. Ours is rational, simple and traditional.

JAC: No, it isn't. You don't handle references right.

IJD: I agree. Mine is the most rational and traditional. Still, I'm willing to compromise on eq.

PCJ: At the end of a sentence there's no problem. Let's re-define.

JAC, IJD, PCJ: [All start babbling together. Words like "traditional", "best", "rational", "makes sense", "full stop" are heard.]

Author: Terrific. Ten years from now, while I'm sweeping the streets for a living because my papers didn't get published they'll still be arguing about full stop or not full stop. Maybe I can start a new tradition. [All join in chorus.]

*Postscript*

IUPAC should lead the way to establishing a uniform format for citing references in the body of a paper, listing references, format of tables, layout of graphs, numbering and referencing equations, tables and graphs, and the format of the references themselves. For the last mentioned I recommend that all chemical journals follow the practice of the Chemical Abstracts Service. (As a final note, let me state that I personally went through the difficulties described by the "Author".)

## Electrochemistry in research and development

Electrochemistry is concerned with the way electricity produces chemical changes and, conversely, chemical changes produce electricity. Processes based on these interactions are found at all levels, from heavy industry to biological phenomena. Although, therefore, there are many established applications, modern research has led to a great expansion in the possibility of using electrochemistry in future developments.

To encourage progress, UNESCO set up an Expert Committee — on Electrochemistry and its Applications — covering Europe and North America. This Committee proposes to organize a Forum on Electrochemistry in Research and Development in Paris, 4–6 June 1984. The objects are to assess future trends in research and development, demonstrate their importance for the needs of modern society, to establish a dialogue between experts in electrochemistry and their colleagues in other disciplines which can make use of electrochemistry, and to present electrochemistry such that non-specialists may be made aware of its potentialities.

The programme will be arranged in four sections with plenary lectures and discussions:

*Electrochemistry and Energy* — solar energy conversion; energy conversion and storage; hydrogen economy.

*Electrochemistry and the Environment* — analysis and removal of pollutants; trace metal analysis; food and drug control.

*Electrochemistry and Biosciences — in vivo* applications; membranes; genetic engineering.

*Electrochemistry and Technology* — potentialities in new technology; processes in chemical industry; polymer electrodes.

At the end of the Forum there will be a session in which the scientists and general public can discuss the main topics dealt with earlier.

Further information can be obtained from Dr. J. Jag, Scientific Cooperation Bureau for the European and North American Region, UNESCO, Place de Fontenoy, 75700 Paris, France.

## UK Company Associates Group

The Society of Chemical Industry has recently taken over responsibility from the Royal Society for the UK Company Associates Group (CAG) of IUPAC. It is intended that CAG should become a forum within which technical issues affecting industry can be fully and frankly discussed. A series of meetings is being arranged to this end, the first of which (27 March 1984) has the title 'Operating with expensive energy — How industry is coping'. Subjects dealt with will include energy saving in the brewing, cement and oil industries, design of plant, short and medium term prospects for different forms of energy, and future developments in energy supply and usage. Further details can be obtained from the Conference Secretariat, Society of Chemical Industry, 14–15 Belgrave Square, London, SW1X 8PS, UK.

## 3rd European Congress on Biotechnology

The Congress is being organized by DECHEMA on behalf of the European Federation of Biotechnology and will be held in Munich, FRG, 10–14 September 1984. Applications and Fundamentals are the basic aspects of the lecture programme and will cover the topics — Fine chemicals/Pharmaceuticals; Basic organic chemicals/Raw materials, including substrates; Fuels and energy; Food and feed; Environmental biotechnology: and, under Fundamentals, Applied microbial physiology; Applied genetics; Cell culture (animals and plants); Biocatalysts; Bioprocesses; Bioreactors; Downstream processing; Measurement and process control. As well as the lecture programme there will be a special seminar on 'Future Aspects in Biotechnology' and various other seminars, workshops and panel discussions.

For further details, write to DECHEMA, Postfach 97 01 46, D-6000 Frankfurt am Main 97, Federal Republic of Germany.

## Heterocycles in Bio-organic Chemistry

The 3rd FECHEM conference on Heterocycles in Bio-organic Chemistry will be held in Balatonfüred, Hungary, 20-23 May 1984. The aim of the conference is to focus attention on diverse aspects of the role of heterocyclic systems in biological processes. The scope of the meeting will include biomimetric synthesis and biosynthesis as well as mechanism of action and structure determination of biologically important heterocycles. Special emphasis is to be given to the application of physical organic principles to biochemical transformations of heterocyclic compounds. The scientific programme will consist of nine invited lectures and a limited number of short communications in poster sessions — the official language will be English. The registration fee is US$100. Further information can be obtained from: Secretariat of 3rd FECHEM Conference on Heterocycles in Bio-organic Chemistry, Dr. M. Simonyi, Central Institute for Chemistry, The Hungarian Academy of Sciences, Budapest Pf 17, H-1525, Hungary.

## EUCHEM Conference on Organic Approaches to Biochemical Problems

The purpose of the Conference, to be held in Port-Camargue, France, 6–7 May 1984, is to illustrate the contribution of the concepts and methods of organic chemistry to the elucidation of biochemical problems. It will emphasize the important questions now being investigated, and developing trends. Guest speakers will include Prof. P. Dervan (California), Prof. A. Eschenmoser (Zurich), Prof. A. Fersht (London), Prof. J. Knowles (Harvard), Prof. D. Mansuy (Paris), Prof. A. Menez (Sallay), Prof. D. Oesterhelt (Munich), Prof. I. Rose (Philadelphia), Prof. C. Walsh (MIT), Prof. G. Whitesides (Harvard). Seventy participants are expected. Further details may be obtained from Prof. A. Marquet, Laboratoire de Chimie Organique Biologique, Université P. et M. Curie, 4 Place Jussieu, 75231 Paris Cedex 05, France.

## Symposium on Chemistry and Developing Countries

The Royal Society of Chemistry and the British Council are celebrating the latter's 50th anniversary by holding the above Symposium at the University of East Anglia, Norwich, UK, 10–12 September 1984. The Symposium is designed to highlight the needs of developing countries in chemical education, training and research and to work out ways of encouraging collaboration between the UK and these countries. The three main sessions planned are: Food and food chemistry; Analysis and quality control; Institutional collaboration in chemical education and research and in the training of chemists and technicians.

Further details may be obtained from E. K. McEwan, the Royal Society of Chemistry, 30 Russell Square, London WC1B 5DT, UK.

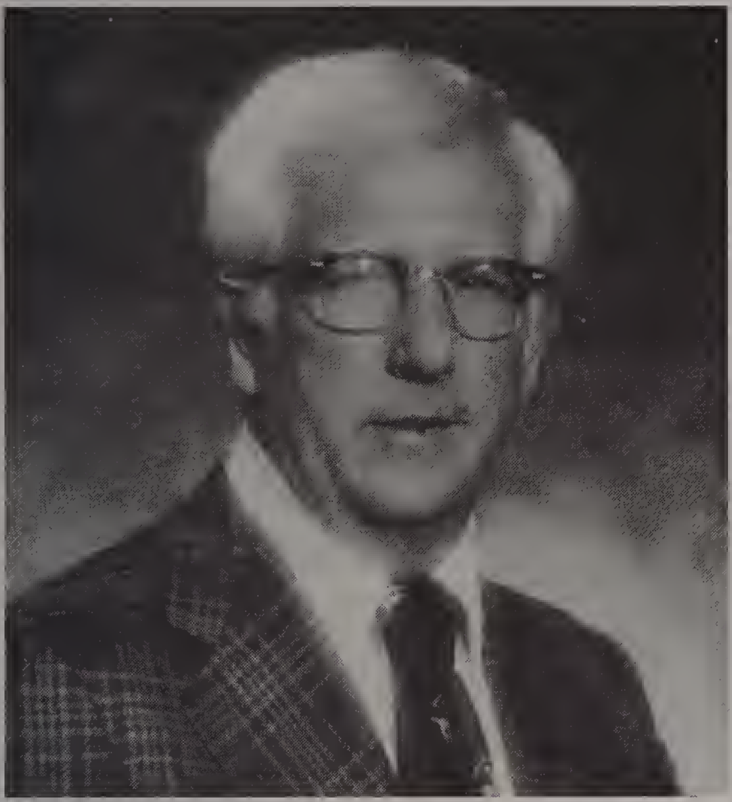
## 11th ICC Congress

The 11th Congress of the International Association for Cereal Chemistry will be held in Vienna, Austria, 6–8 June 1984. Plenary lectures will be presented by Mr. J. M. Hutchinson, FAO; Dr. P. Feillet, France; Dr. L. Munck, Denmark; and Dr. K. H. Tipples, Canada. In addition there will be three symposia — Storage problems; Cereal products in the light of modern nutrition research; Present state of NIR technique — applications in the field of cereal chemistry. All these events will be held with simultaneous translation facilities from and into English, French, German and Russian. The Congress will be preceded by a symposium on Processing of sorghum and millets, 1984. The participation fee will be AS2000.

For further information write to Internationale Gesellschaft für Getreidechemie, Schmidgasse Nr. 3-7, A-2320 Schwechat, Austria.

## 1984 AOAC President

Professor C. W. Gehrke has been elected President of the Association of Official Analytical Chemists (AOAC) for 1984. He is Professor of Biochemistry and Manager of the Experiment Station Chemical Laboratories at the University of Missouri-Columbia and also serves as Missouri State Chemist.



Dr. Charles Gehrke, AOAC President.

## Names and addresses

Some changes in the addresses listed in CI 1983, No. 5:

*Chairman* — I.3

Prof. S. TRASATTI,
Dipartimento di Chimica Fisica ed Elettrochimica,
Via Venezian 21, I-20133 Milano, Italy.

**(Tel: +39 (2) 293516. Telex: 320484 UNI MI)**

*Secretary* — VI.5

Dr. R. GREENHALGH,
Chemistry and Biology Research Institute,
Agriculture Canada,
Ottawa, Ontario K1A 0C6, Canada.

**(Tel: +1 (613) 995 3700. Telex: 053 3283 CANAGRI)**

*Secretary* — CHEMRAWN
Dr. H. EGAN,
5 Highland Road,
Amersham,
Buckinghamshire HP7 9AP, UK.

**(Tel: +44 (2403) 28629)**

## It might have been better put

Many of you surely must have come across sentences or phrases in scientific papers which didn't quite mean what they said, were capable of being read in the wrong way by the not-too-serious minded or, because of a misspelt word (e.g. "...the stationery phase in paper chromatography...") might raise a smile or an eyebrow. Please let me have them so that we can try to counteract some of the weight of the rest of *Chemistry International.* Examples in any language will be published verbatim but anonymous contributions will not be accepted.

A long time ago, when I occasionally refereed papers for a journal, I came across these statements:

> "Method 3 was least satisfactory since all three analysts found that it was difficult to reproduce from day to day."
>
> "The conversion of optical density into ppm F varies with the size of graph paper used, etc."

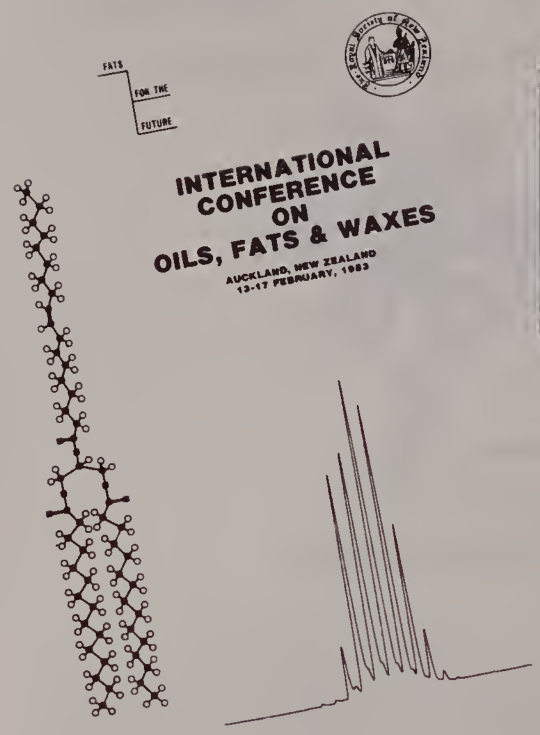
Well, they could have been put better.

Or try this one, from a recent ICSU Newsletter:

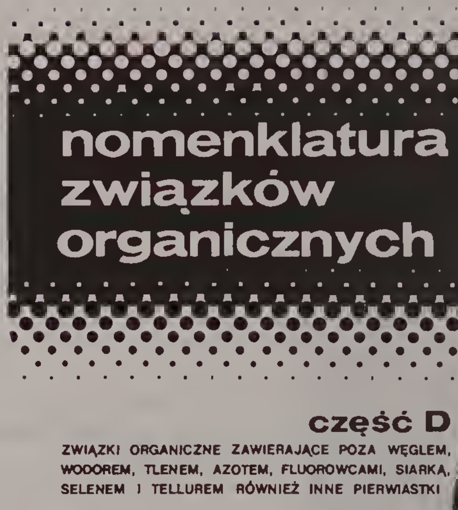
"The Committee agreed to restrict the study to the disposal of toxic wastes that resulted from human activities, and that it should not concern itself with hazardous wastes in general, such as acids, caustic and corrosive materials, etc."

I have to admit that it is not clear to me what actually is being studied.

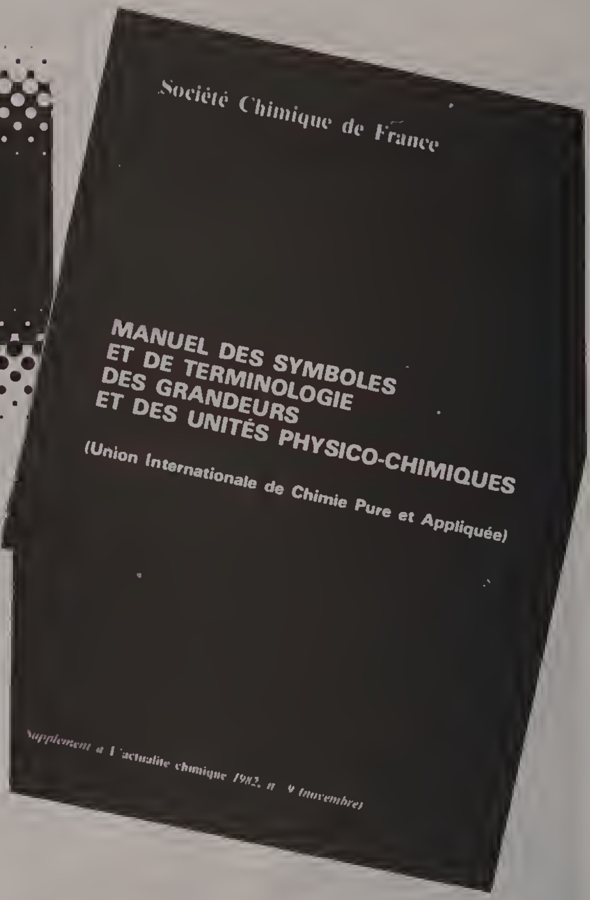
**R. W. Fennell**


FATS
FOR THE
FUTURE

INTERNATIONAL
CONFERENCE
ON
OILS, FATS & WAXES
AUCKLAND, NEW ZEALAND
13-17 FEBRUARY, 1983


nomenklatura
związków
organicznych

część D
ZWIĄZKI ORGANICZNE ZAWIERAJĄCE POZA WĘGLEM,
WODOREM, TLENEM, AZOTEM, FLUOROWCAMI, SIARKĄ,
SELENEM I TELLUREM RÓWNIEŻ INNE PIERWIASTKI


Société Chimique de France

MANUEL DES SYMBOLES
ET DE TERMINOLOGIE
DES GRANDEURS
ET DES UNITÉS PHYSICO-CHIMIQUES
(Union Internationale de Chimie Pure et Appliquée)

Supplément à l'actualité chimique 1982, n° 9 (novembre)

無機化学命名法
[増 訂 版]

山 崎 一 雄 訳 著

南 江 堂

IUPAC

Organ-Directed
Toxicity
Chemical Indices and Mechanisms

Editors:
Stanley S. Brown
and Donald S. Davies

Pergamon Press

IUPAC
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY
28TH MACROMOLECULAR SYMPOSIUM

PROCEEDINGS

MACRO
82
AMHERST

Papers
Presented at the
University of Massachusetts,
Amherst, Ma.
July 12-16, 1982
Meeting

PURIFICATION
OF SOLVENTS
AND TESTS FOR IMPURITIES

IUPAC

Pergamon Press

The visible results of IUPAC work are publications. Do you know which Divisions are associated with the above? We regret there are no prizes for all-correct answers.

# IUPAC CONFERENCES

Additional information from address in parentheses

## 1984

### BIOTECHNOLOGY

February 19 - 25. 7th International Biotechnology Symposium. New Delhi, India.
(Prof. T. K. Ghose, Chairman, National Organization Committee & Head, Biochemical Engineering Research Centre, Indian Institute of Technology, Hauz Khas, New Delhi-110029, India.)

### HIGH TEMPERATURE MATERIALS

April 2–6. 4th International Conference on High Temperature and Energy Related Materials. Santa Fe, New Mexico, USA.
(IUPAC High Temperature Conference, Mary Bowen, Los Alamos National Laboratory, CHM-DO, Mail Stop J563, Los Alamos, NM 87545, USA).

### LOW-DIMENSIONAL SYNTHETIC METALS

June 17–22. International Conference on the Physics and Chemistry of Low-dimensional Synthetic Metals. Abano Terme, Italy.
(Prof. G. Zerbi, Dipartimento di Chimica Industriale e Ingegneria Chimica, Politecnico di Milano, Piazza Leonardo da Vinci 32, I-20133 Milano, Italy.)

### SOURCES OF ORGANIC MATERIALS

June 25–29. Resource Material Conversion to meet Future Needs — (Bio-) Chemical Process Bridges, CHEMRAWN III. The Hague, The Netherlands.
(Congress Bureau, QLT Convention Services, Keizersgracht 792, 1017 EC Amsterdam, The Netherlands.)

### CARBOHYDRATES

July 1–7. 12th International Carbohydrates Symposium. Utrecht, Netherlands.
(Prof. J. F. G. Vliegenthart, c/o Secretariat XIIth International Carbohydrate Symposium, Department of Bio-Organic Chemistry, State University of Utrecht, P.O. Box 5055, NL-3502 JB Utrecht, Netherlands.)

### MODIFIED POLYMERS

July 2–5. 6th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia.
(Dr. A. Romanov, Director, Polymer Institute, Slovak Academy of Sciences, Dubravska Cesta, CS-842 36 Bratislava, Czechoslovakia.)

### CATALYSIS

July 2 - 6. 8th International Congress on Catalysis. Berlin, Federal Republic of Germany.
(DECHEMA, P.O. Box 970146, D-6000 Frankfurt am Main 97, Federal Republic of Germany.)

### MEDICAL POLYMERS

July 9–12. 26th Prague Microsymposium on Macromolecules: Polymers in Medicine and Biology. Prague, Czechoslovakia.
(26th Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 616, Czechoslovakia.)

### NATURAL PRODUCTS

July 9 - 14. 14th International Symposium on the Chemistry of Natural Products. Poznań, Poland.
(Prof. dr. Maciej Wiewiorowski, Institute of Bioorganic Chemistry, Polish Academy of Sciences, ul. Noskowskiego 12/14, 61-704 Poznań, Poland.)

### MACROMOLECULES

July 16–19. 27th Prague Microsymposium on Macromolecules: Physical Optics of Dynamic Phenomena and Processes in Macromolecular Systems. Prague, Czechoslovakia.
(27th Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 616, Czechoslovakia.)

### PHOTOCHEMISTRY

July 23-27. 10th IUPAC Symposium on Photochemistry. Interlaken, Switzerland.
(PD Dr. A. M. Braun, Institut de chemie physique, EPFL, Ecublens, CH-1015 Lausanne, Switzerland.)

### COORDINATION CHEMISTRY

July 29–August 3. 23rd International Conference on Coordination Chemistry. Boulder, CO, USA.
(Prof. Cortlandt Pierpont, Secretary 23rd International Conference on Coordination Chemistry, Campus Box 215, University of Colorado, Boulder, CO 80309, USA.)

### CHEMICAL THERMODYNAMICS

August 13–17. Conference on Chemical Thermodynamics. Hamilton, Canada.
(Dr. P. A. G. O'Hare, Argonne National Laboratory, Chemical Technology Division, 9700 South Cass Avenue, Argonne, IL 60439, USA.)

### NON-AQUEOUS SOLUTIONS

August 13–17. 9th International Conference on Non-aqueous Solutions. Pittsburgh, Pennsylvania, USA.
(Prof. J. F. Coetzee, Department of Chemistry, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA.)

### PHYSICAL ORGANIC CHEMISTRY

August 20–24. 7th IUPAC Conference on Physical Organic Chemistry. Aukland, New Zealand.
(Prof. B. R. Davis, Chemistry Department, University of Aukland, Private Bag, Aukland, New Zealand.)

### SOLUBILITY PHENOMENA

August 21–23. 1st International Symposium on Solubility Phenomena. London, Ontario, Canada.
(Prof. J. W. Lorimer, c/o Dr. R. Paterson, Chemistry Department, The University, Glasgow, G12 8QQ, UK.)

### COLLOIDS AND MACROMOLECULES

August 22–24. International Symposium on Physical Chemistry of Colloids and Macromolecules. Uppsala, Sweden.
(Prof. B. Ranby, Department of Polymer Technology, Royal Institute of Technology, S-100 44 Stockholm, Sweden.)

### ORGANIC SYNTHESIS

August 27–30. 5th International Conference on Organic Synthesis. Freiburg i. Br., FRG.
(Prof. H. Prinzbach, Chemisches Laboratorium, Albert-Ludwigs-Universität, Albertstrasse 21, D-7800 Freiburg i. Br., FRG.)

### CAROTENOIDS

August 27–31. 7th International Symposium on Carotenoids. Munich, FRG.
(Prof. W. Rau, Botanisches Institut der Universität München, Menzinger Strasse 67, D-8000 München 19, Federal Republic of Germany.)

### SOLID FILMS AND SURFACES

August 27–31. 3rd International Conference on Solid Films and Surfaces. Sydney, Australia.
(Prof. D. Haneman, School of Physics, University of New South Wales, P.O. Box 1, Kensington, N.S.W. 2033, Australia.)

### MEDICINAL CHEMISTRY

August 27–31. 8th International Symposium on Medicinal Chemistry. Uppsala, Sweden.
(Prof. J. L. G. Nilsson, APOTEKSBOLAGET AB, Central Laboratory, Box 3045, S-171 03 Solna, Sweden.)

### RAMAN SPECTROSCOPY

August 27–September 1. 9th International Conference on Raman Spectroscopy. Tokyo, Japan.
(Prof. Mitsuo Tasumi, Department of Chemistry, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

### REACTIVITY OF SOLIDS

August 27–September 1. 10th International Symposium on the Reactivity of Solids. Dijon, France.
(10e ISRS, Secrétariat Exécutif, Laboratoire de Réactivité des Solides, Faculté des Sciences Mirande, B.P. 138, F-21004 Dijon Cédex, France.)

### LUMINESCENCE SPECTROMETRY

September 3–6. International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr. W. R. G. Baeyens, Fakulteit van de Farmaceutische Wetenschappen, Laboratoria voor Farmaceutische Chemie en Ontleding van Geneesmiddeln, Harelbekestraat 72, B-9000 Gent, Belgium.)

### ORGANOSILICON CHEMISTRY

September 9-14. 7th International Symposium on Organosilicon Chemistry. Kyoto, Japan.
(Prof. M. Kumada, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshida Honmachi, Sakyo-ku, Kyoto 606, Japan.)

### POLYMER CHEMISTRY

September. Symposium on Polymer Chemistry with special emphasis on Photochemical Processes. Leuven, Belgium.
(Prof. M. Van Beylen, Laboratorium voor Macromoleculaire en Organische Scheikunde, Katholieke Universiteit Leuven, Celestijnenlaan 200 F, B-3030 Leuven (Heverlee), Belgium.)

### AUTOMATION

October 15–18. 2nd International Congress on Automation in the Clinical Laboratory. Barcelona, Spain.
(The Secretary of the Second Congress, Dr. R. Galimay, Apartado de Correos 543, Barcelona, Spain.)

### COLLABORATIVE CHEMICAL ANALYSIS

October 25–27. 2nd International Symposium on the Harmonization of Collaborative Analytical Studies. Washington, DC, USA.
(Dr. H. Egan, Laboratory of the Government Chemist, Cornwall House, Stamford Street, London SE1 9NQ, UK.)

## 1985

### POLYMER ANALYSIS

February 11–14. POLYMER 85: Characterization and Analysis of Polymers. Melbourne, Australia.
(Dr. J. H. O'Donnell, Polymer & Radiation Group, Department of Chemistry, University of Queensland, Brisbane 4067, Australia.)

### POLYMER COMPOSITES

July 8–11. 28th Microsymposium on Macromolecules: Polymer Composites. Prague, Czechoslovakia.
(Dr. P. Cefelin, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 1888 Petriny, Prague 6, Czechoslovakia.)

### ORGANOMETALLIC CHEMISTRY

July 12–15. 3rd International Symposium on Organometallic Chemistry directed toward Organic Synthesis. Kyoto, Japan.
(Prof. H. Nozaki, Department of Industrial Chemistry, Kyoto University (Kogaku-Bu), Yoshida, Kyoto, 606 Japan.)

### AROMATIC COMPOUNDS

July 15–19. 5th International Symposium on Novel Aromatic Compounds. St. Andrews, UK.
(Dr. P. J. Garratt, Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, UK.)

### MACROMOLECULES

August 18–23. 30th International Symposium on Macromolecules. The Hague, Netherlands.
(Dr. J. A. M. Smit, Gorlaeus Laboratories, University of Leiden, Department of Chemistry, P.O. Box 9502, NL - 2300 RA Leiden, Netherlands.)

### CHEMICAL EDUCATION

August 18–23. 8th International Conference on Chemical Education: Widening the Scope of Chemistry. Tokyo, Japan.
(Prof. M. Òki, Department of Chemistry, Faculty of Science, The University of Tokyo, Tokyo 113, Japan.)

### THERMAL ANALYSIS

August 19–23. 8th International Conference on Thermal Analysis. Bratislava, Czechoslovakia.
(Dr. P. K. Gallagher, Rm 6D-311 Bell Laboratories, Murray Hill, New Jersey 07974, USA.)

### MASS SPECTROMETRY

September 8–13. 10th International Symposium on Mass Spectrometry. Swansea, UK.
(Prof. J. H. Beynon, Royal Society Research Unit, University College of Swansea, Swansea SA2 8PP, UK.)

### IUPAC CONGRESS

September 9–13. 30th International Congress of Pure and Applied Chemistry. Manchester, UK.
(The Royal Society of Chemistry, Burlington House, London, W1V 0BN, UK.)

### CHEMICAL RESOURCES OF THE OCEAN

September 22–28. Chemical Resources of the Global Oceans — CHEMRAWN IV. Massachusetts, USA.
(J. R. Moore, Director, Marine Science Institute, University of Texas, Austin, TX 78712, USA.)

## 1986

### PESTICIDE CHEMISTRY

August 10–17. 6th International Pesticide Chemistry Congress. Ottawa, Canada.
(Dr. H. V. Morley, London Research Station, Agriculture Canada, University Sub-Post Office, London, Ontario, Canada.)

### PHYSICAL ORGANIC CHEMISTRY

August. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan.
(Prof. M. Oki, Department of Chemistry, Faculty of Science, University of Tokyo, Tokyo 113, Japan.)

MAJOR REFERENCE WORKS ON PESTICIDES FROM IUPAC

# PESTICIDE CHEMISTRY:
## HUMAN WELFARE AND THE ENVIRONMENT

Proceedings of the 5th International Congress, Kyoto, Japan,
29 August - 4 September 1982

**Editors-in-Chief:**
J MIYAMOTO, *Pesticides Division, Sumitomo Chemical Co. Ltd, Takarazuka, Hyogo, Japan*
P C KEARNEY, *Agricultural Environmental Quality Institute, US Department of Agriculture, Beltsville, MD, USA*

**Editors:** P DOYLE, *ICI Plant Protection Division, Bracknell, Berks, UK*, T FUJITA, *Kyoto University, Japan*, N TAKAHASHI, *University of Tokyo, Japan*, S MATSUNAKA, *Kobe University, Japan*, D H HUTSON, *Shell Research Ltd, Sittingbourne, Kent, UK*, S D MURPHY, *University of Texas Medical School, Houston, USA*, R GREENHALGH, *Agriculture Canada, Ottawa, Ontario, Canada*, N DRESCHER, *BASF Aktiengesellschaft, Limburgerhof, Federal Republic of Germany*.

Covers all aspects of pesticide science, chemical and biological, and their impact on man and the environment. Over 250 papers explore the complete range of problems associated with this extremely complex and economically important industry. The synthesis, chemical structure and biological activities of various pesticides are discussed in detail. Their modes of action and toxicology in the environment are explored, both as they affect pests and other life. In keeping with the importance of government regulation, residue analysis is a further vital topic. For pesticide scientists, organic and analytical chemists, and policy makers in government and industry.

**Contents (partial):**

**Volume 1: Synthesis and Structure-Activity Relationships**

PLENARY LECTURES: Political, economic and philosophical aspects of pesticide use for human welfare, K H Büchel. Pesticide research for the improvement of human welfare, I J Graham-Bryce. SYNTHESIS OF PESTICIDES AND GROWTH REGULATORS: Stereoselective synthesis of pheromones via phosphonium ylides, H J Bestmann. Problems and opportunities with pheromones, R Baker. CHEMICAL STRUCTURE AND BIOLOGICAL ACTIVITY: Structure-activity relationships in derivatives of anticholinesterase insecticides, T R Fukuto. Sulfonylureas: new high potency herbicides, G Levitt.

**Volume 2: Natural Products**

BIOACTIVE NATURAL PRODUCTS: CHEMISTRY, BIOCHEMISTRY AND PHYSIOLOGY: Biological activities and structures of host-selective pathotoxins, J M Daly *et al.* Endocrine strategies for insect control, W S Bowers. PYRETHROID INSECTICIDES: BIOLOGICAL ACTIVITY, MODE OF ACTION, METABOLISM AND TOXICOLOGY. ANTIBIOTICS FOR AGRICULTURAL USE. HERBICIDES AND PLANT GROWTH REGULATORS FOR RICE CULTURES.

**Volume 3: Mode of Action, Metabolism and Toxicology**

BIOCHEMISTRY OF PESTS AND MODE OF ACTION OF PESTICIDES: Behavioral and lethal actions of amidines on invertebrates, R M Hollingworth. Toxic oxygen species and herbicide action, A D Dodge. METABOLISM AND DEGRADATION OF PESTICIDES AND XENOBIOTICS: Propesticides — bioactivation in pesticide design and toxicological evaluation, J E Casida. Selective toxicity conferred by activation, W C Dauterman. TOXICOLOGY OF PESTICIDES AND XENOBIOTICS: The role of biochemical studies in modern toxicological assessment of pesticides, W N Aldridge. Neurophysiological and behavioral assessment of pesticide toxicity, A M Revzin.

**Volume 4: Pesticide Residues and Formulation Chemistry**

PESTICIDE RESIDUES AND METHODOLOGY: Analysis of xenobiotics in air, J N Seiber *et al.* Pesticide residues in soil: problems between concept and concern, H Frehse. FORMULATION CHEMISTRY: Dispersion science and technology in pesticide formulation, Th F Tadros. Developments in formulation and application technology for safe use of agrichemicals, C Corty.

*X: IUPAC Symposium Series*
4 Volume Set
1796pp April 1983
0 08 029219 4 (H) **US$390.00 £195.00**

---

# ADVANCES IN PESTICIDE SCIENCE

Proceedings of the 4th International Congress of Pesticide Science, Zurich, Switzerland

**Editors:** H GEISSBÜHLER, *Ciba-Geigy Ltd, Basle, Switzerland*, P C KEARNEY, *USDA, Bethesda, Maryland, USA* and G T BROOKS, *University of Sussex, Brighton, UK*.

**Independent Opinion**

*"It is clearly of enormous interest to all those engaged in pesticide R & D and can hardly fail to be of lasting value."* **Chemistry in Britain**

*"Availability of these volumes, transcribing the IUPAC Symposium, is of substantial value to the research community and essential to pesticide researchers."* **Cancer Biochemistry and Biophysics**

*"These volumes must warrant space on the shelves of libraries because, taken as a whole, the papers use present knowledge and existing shortcomings to provide new conceptions and insights as signposts to future research activity."* **Endeavour**

*X: IUPAC Symposium Series*
3 Volume Set
835pp 1979
0 08 022349 4 (H) **US$240.00 £110.00**

H = Hardcover
X = Books published in Series. Standing/continuation orders invited. Prices are subject to change without notice. Sterling prices apply to UK and Eire customers only.

**PERGAMON PRESS**
Headington Hill Hall, Oxford, OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

12/82/5B/12

**Chemistry International**

is the news magazine of the

# INTERNATIONAL UNION of PURE and APPLIED CHEMISTRY (IUPAC)

---

*President:* W. G. SCHNEIDER *(Canada)*
*Vice-President:* C. N. R. RAO *(India)*
*Secretary-General:* T. S. WEST *(UK)*
*Treasurer:* A. BJÖRKMAN *(Denmark)*

**IUPAC Secretariat**
Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)

Telephone: + 44 (865) 717744
Telex: 83147 attn. IUPAC  Telegrams: IUPAC OXFORD

---

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:
to promote continuing co-operation among the chemists of the member countries;
to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
to co-operate with other international organizations which deal with topics of a chemical nature;
to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 45 countries, each represented by a national organization, such as an academy of science or research council.

---

NATIONAL MEMBER ORGANIZATIONS

Academy of Scientific Research and Technology (**Arab Republic of Egypt**)
Asociación Química Argentina (**Argentina**)
Australian Academy of Science (**Australia**)
Verein Österreichischer Chemiker (**Austria**)
Comité National Belge de Chimie (**Belgium**)
Associação Brasileira de Química (**Brazil**)
Bulgarian Academy of Sciences (**Bulgaria**)
National Research Council of Canada (**Canada**)
Chinese Chemical Society, and Chemical Society located in Taipei, China (**China**)
Ministerio de Minas y Petróleos (**Colombia**)
Academia de Ciencias de la República de Cuba (**Cuba**)
Czechoslovak National Committee of Chemistry (**Czechoslovakia**)
Det Kongelige Danske Videnskabernes Selskab (**Denmark**)
Suomen Kemian Seura (**Finland**)
Comité National Français de la Chimie (**France**)
Deutscher Zentralausschuss für Chemie (**Federal Republic of Germany**)
Akademie der Wissenschaften der DDR (**German Democratic Republic**)
Association of Greek Chemists (**Greece**)
Hungarian Academy of Sciences (**Hungary**)
Indian National Science Academy (**India**)
Iraqi Chemical Society (**Iraq**)
Royal Irish Academy (**Ireland**)
Israel Academy of Sciences and Humanities (**Israel**)
Consiglio Nazionale delle Ricerche (**Italy**)
Science Council of Japan (**Japan**)
Malaysian Institute of Chemistry (**Malaysia**)
Koninklijke Nederlandse Chemische Vereniging (**Netherlands**)
Royal Sociey of New Zealand (**New Zealand**)
Norsk Kjemisk Selskap (**Norway**)
Sociedad Química del Perú (**Peru**)
Polska Akademia Nauk (**Poland**)
Sociedade Portuguesa de Química (**Portugal**)
Korean Chemical Society (**Republic of Korea**)
Council for Scientific and Industrial Research (**Republic of South Africa**)
Academia Republicii Socialiste România (**Romania**)
Consejo Superior de Investigaciones Científicas (**Spain**)
Svenska Nationalkommittén för Kemi (**Sweden**)
Schweizerisches Komitee für Chemie (**Switzerland**)
Supreme Council of Sciences (**Syrian Arab Republic**)
Türkiye Kimya Dearneği (**Turkey**)
Academy of Sciences of USSR (**USSR**)
Royal Society (**United Kingdom**)
National Research Council, National Academy of Sciences (**USA**)
Instituto Venezolano de Investigaciones Científicas (**Venezuela**)
Unija Hemijskih Društava Jugoslavije (**Yugoslavia**)

# Chemistry International

IUPAC

## Contents 1984, No. 1 (February)

1 Editorial

2 The Secretary-General's Column

4 IUPAC publications

4 IUPAC people

5 The International Commission on Atomic Weights—An Early Historical Review

12 Letters to the Editor

13 Other people's publications

14 Summary minutes of Committee and Commission meetings

17 Membership list of IUPAC bodies 1983–1985

49 Summary minutes *(continued)*

52 IUPAC-sponsored Conferences

54 CHEMRAWN—especially CHEMRAWN III

55 Recent reports

56 Tradition! Full Stop

57 Electrochemistry Forum; UKCAG; Biotechnology Congress

58 Some non-IUPAC Conferences

59 AOAC President; Names and addresses *(amendments to lists in CI, 1983, No. 5)*; It might have been better put

60 Puzzle corner

61 IUPAC Conferences

ISSN 0193–64

Printed by The Nuffield Press Limited, Oxford.

# Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

1984, No. 2 (April)

Pergamon Press

# CHEMISTRY INTERNATIONAL

## The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Roger Fennell
PRODUCTION EDITOR: Richard J. Palmer

## EDITORIAL ADVISORY BOARD

*Chairman:* T. S. WEST *Secretary-General*
H. EGAN CHEMRAWN *Committee*
R. DEGAIN *Committee on Chemistry and Industry*
D. P. DEN OS *Committee on Publications*
L. PAOLONI *Committee on Teaching of Chemistry*
K. L. LOENING *Interdivisional Committee on Nomenclature and Symbols*
K. S. W. SING *Division I*
E. FLUCK *Division II*
N. J. LEONARD *Division III*
M. MANDEL *Division IV*
G. DEN BOEF *Division V*
L. E. COLES *Division VI*
D. B. TONKS *Division VII*
*Secretary:* R. W. FENNELL *Editor*

## SUBSCRIPTIONS

Six issues of *Chemistry International* will be published in 1984. Annual subscription rate including postage is US$20 for individuals, and US$40 for libraries. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, UK.

## REPRODUCTION OF ARTICLES

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International.* Permission to reproduce articles will normally be granted at no cost to non-profit making bodies (such as National Adhering or Associated Organizations of IUPAC, National Chemical Societies, or International Scientific Unions). Permission for commercial publishers will normally be conditional upon publication of an advertisement for IUPAC publications. In all cases, please contact the IUPAC Secretariat for clearance.

**Front cover:** Institute of Macromolecular Chemistry, Prague, venue of the long series of Microsymposia *(photo courtesy of PMM Secretariat).*

Pergamon Press

Oxford New York Toronto Sydney Paris Frankfurt
© 1984 International Union of Pure and Applied Chemistry

# EDITORIAL

Opinions expressed here are those of the author, and do not necessarily reflect the views or policy of IUPAC

The echoes of Lyngby are fading — this issue of CI contains the last of the summary minutes of the General Assembly meetings and, with them, the completion of the experiment of publishing these minutes in regular issues of CI rather than in the Supplement. Whether this experiment should be regarded as successful or not depends entirely on the judgement of you, the readers. Is it better to have information given in these minutes piecemeal and as early as possible or all together in one volume but later — the Supplement will probably appear in June? If you have any strong feelings about this, please write to me.

Having just finished with the General Assembly meetings, we are now looking forward to the 1984 meetings. It was suggested by one of you that it would be useful to advertise meetings of IUPAC bodies in CI so, as we are always willing to take up ideas that are easily put into practice, a provisional list is given on pp.22–23. This list will be updated as more definite information becomes available. I shall, of course, welcome summary minutes of these meetings (with any relevant photographs) just as soon as they can be got to me.

I noticed in the minutes of the Committee on Publications that some Commissions had been querying the necessity — or even desirability — of publishing Commission reports in PAC rather than in specialist journals (see p.3) This is a matter I touched on in my first Editorial (CI, 1983, No.1) and took a little further in CI, 1983, No.4, p.30, where I referred to the mechanism for republication or translation of reports detailed in *Current Programmes* 1983. I hope there is now no doubt that the Union is only too willing to allow IUPAC reports to be republished in specialist journals *after* publication in PAC. A note to this effect now appears on the inside front cover of PAC. Subject closed?

One of our regular features comes under the heading 'IUPAC-sponsored Conferences' and is intended to put some meat on to the bare bones of the calendar of meetings published at the end of each issue. The value of this feature depends very much on when I get details of the Conference arrangements and in CI, 1983, No.3, p.19 I expressed the hope that we would have a better system working in 1984. Regrettably, as the uneven coverage in this issue exemplifies, the system is not working properly! If you have any influence on the organizers of IUPAC-sponsored meetings, would you remind them of the opportunity offered to advertise their meetings in CI? For the first time during my editorship I have received a report of an IUPAC-sponsored Conference. I hope you will agree with me that this is a welcome addition to our overall coverage of IUPAC events. If you can spare the time to comment on a (IUPAC) Conference that you attended, send your contribution to your Editorial Advisory Board member (see inside front cover) for onward transmission to me.

Once again I am pleased to be able to publish an article from one of our Commissions, this time on visual aids in teaching by Dr. H. G. J. Worth, Commission VII.3. Some of you may remember an earlier article (CI, 1980, No.2, pp.11-16, republished in CI, 1981, No.3, pp.29-34), based on essays by Prof. G. Ourisson, entitled *Presenting your research results*. Although the subject of visual aids was included in the earlier article, Dr. Worth's approach is quite different and it seems entirely appropriate to publish another aspect of that most important activity — communication. After all, that is what CI is all about.

You will find, on pp.33-35, a list of ISO Standards issued during 1983. Are such lists useful or not? Please let me know — I am not so short of copy that I have to publish material that *nobody* wants. While extracting these 'chemical' standards I was impressed by the number and range of ISO Standards issued during a twelve-month period. When one considers that commercial interests also have a part to play in the agreement necessary for an ISO Standard — in IUPAC scientific interests are paramount — it is remarkable that so many are issued, even if a high proportion are very limited in scope. International cooperation at the scientific and technical levels at least must be flourishing. In our own case, we have a spate of Commission reports in the publication process — evidence of all the hard work at the General Assembly. We look forward to seeing them in PAC and then — remember? — in your favourite specialist journals.

**The Editor prepares to meet his critics**

# SUMMARY MINUTES OF COMMITTEE AND COMMISSION MEETINGS

## Committee on Publications: Lyngby, Denmark, 20–22 August 1983

### Basic IUPAC publication policy

The Committee noted that the IUPAC Executive Committee required that the Union must at least balance its publications budget. It was suggested that any surplus in the publications account might be used to assist better dissemination of publications (e.g. by buying extra copies or reprints for distribution or waiving royalties on flexicover editions of some books) and/or to fund joint symposia or seminars with other organizations, e.g. a second seminar with editors of chemistry journals (the first one was held in Vancouver, 1981).

### Critical Assessment Report

The following statement had appeared in the Vice-President's Critical Assessment Report:

> "Dissatisfaction with IUPAC's current publication program is fairly widespread. Specifically, publication of IUPAC recommendations in the journal *Pure and Applied Chemistry* rather than in specialist research journals is considered inadequate, and Pergamon-produced books are considered too expensive."

The Committee considered that the comments could not be justified in view of the small number of dissatisfied Commissions who were probably unaware of the IUPAC policy on republication of IUPAC recommendations in specialist journals; the comparative prices of books had not been examined but would be considered in next contract negotiations. The Committee did not consider that the copyright release should be automatic but did recommend that the waiting period before reproduction should be reduced and that conditions for reproduction should be stated simply in PAC.

### *Pure and Applied Chemistry* (PAC)

The Chairman reported that he had agreed with a recommendation to the Executive Committee that the post of Scientific Editor should not be filled but that a small Editorial Board should be formed to guide the Executive Editor (Scientific Publications Secretary) in the running of PAC. The main function of the Board was expected to be the provision of scientific expertise for difficult symposia manuscripts.

It was noted that total sales of PAC during 1982 had held steady compared with 1981 and that Pergamon Press intended to maintain the 1984 subscription rates at the 1983 levels.

### Symposia volumes outside PAC

Pergamon Press had published five symposia books since April 1982 — *Recent Advances in Analytical Spectroscopy, Carotenoid Chemistry and Biochemistry, Current Trends in Organic Synthesis, Pesticide Chemistry: Human Welfare and the Environment* (4 volumes), *Chemistry and World Food Supplies.* A further symposium book, *Safe Use of Solvents,* had been published by Academic Press. Recent best sellers were *Recent Advances in Analytical Spectroscopy* (sold out, 'copyflo' edition being supplied), *Frontiers of Chemistry* (stocks nearly exhausted), *Organic Synthesis — Today and Tomorrow* and *27th Macromolecules.*

### Chemical Data Series

The Committee discussed in detail books published under Chemical Data Series and under IUPAC Reference Books. It was appalled to note that only one reference book had been published during the biennium, viz. *Purification of Solvents: Tests for Impurities.* The book was so well received that it had recently gone out of stock and Pergamon Press had ordered a regular reprinting.

Pergamon reported the success achieved by data books on stability constants. Dr. Perrin's compilation *Organic Ligands* (published 1979) had recently been reprinted; Dr. Högfeldt's *Inorganic Ligands* (published 1982) was being reprinted. The Committee noted with deep concern that apart from the Analytical, Physical and, recently, Inorganic Chemistry Divisions no other Division appeared to be even planning to compile data books. The Chairman offered to make a statement at the Division Presidents' meeting in Lyngby and if this could not be arranged to write to the Division Presidents (Secretaries) of, in particular, Organic and Macromolecular Divisions with a request to encourage the compilation of data books and reference books through their Commissions.

It was noted that four volumes of the Solubility Data Series (Nos. 9, 10, 12 and 13) had been published since April 1982 and a further volume (No.14) was in the press. The subscription sales had been rising gradually.

### Subcommittee on Numeric Data Bases

The Chairman informed the Committee that the *ad hoc* Committee on Numeric Data Bases (CNDB), constituted at the 46th Bureau meeting (September 1982) under the Chairmanship of Dr. W. G. Schneider, held a preliminary meeting in Cologne (June 1983) and a full meeting at Lyngby; he had attended both meetings. The most significant recommendations made to the Bureau were: (i) computer-readable data bases will become an important output and IUPAC should take action to monitor the creation of such data bases by its Commissions and to manage their dissemination in a systematic manner; (ii) to create a 5–6 member advisory committee with members having expertise and experience in computerized data bases and chemical information systems; (iii) to set up initially 2–3 pilot projects with minimum IUPAC financial involvement; (iv) because of the increasing close relationship of computerized (electronic) publishing and computer data bases, the convener of the advisory committee should also be a member (or *ex officio* member) of the Publications Committee.

*Chemistry International* (CI)
The Chairman explained that the new style magazine published since the start of 1983 had been devoted almost exclusively to IUPAC affairs and was produced by a temporary part-time Editor — a past Division Secretary. An Editorial Advisory Board for CI had recently been set up with terms of reference that relieved the Committee of responsibility for the contents of the magazine.

The Committee appreciated that Pergamon was not proposing to increase the 1984 subscription rates.

**Membership**
Dr. Schneider had recommended that the Convener of the proposed Advisory Committee on Numeric Data Bases should become a Member or *ex officio* Member of the Committee.

**Next Meeting**
The Committee agreed to meet in Oxford, 1–3 July 1984.

**ICSU Press**
The Chairman reported that ICSU Committee on Publications and Communications (COPAC) had been provided with a budget to enable it to continue the establishment of ICSU Press. Prof. W. J. Whelan (IUB) was the Chairman and Dr. D. P. den Os (IUPAC) was the Secretary-Treasurer of the ICSU Press Board of Management.

**P. D. Gujral**

## Interdivisional Committee on Nomenclature and Symbols (IDCNS):
### Lyngby, Denmark, 17 and 18 August 1983

Following reviews of the work of IUPAC Divisions and Commissions, activities of other international organizations dealing with nomenclature and symbols were discussed. The Consultative Committee for Units has rejected the term ‘‘dalton’’ as a replacement for atomic mass unit because it is not an SI unit and as a result of a general policy of avoiding the introduction of new names for units. In the IUPAP (SUN-AMCO), revision of *Symbols, Units, and Nomenclature in Physics* is continuing; the need for a symbol for $10^{-3}$kg mol$^{-1}$ was considered inconclusively in IDCNS. Regarding names for heavy elements ($Z>103$), IDCNS recommended that the Inorganic Chemistry Division review existing IUPAC policies and that problems related to the names of elements for which discovery has been claimed be referred to the IUPAC Executive Committee. Since the previous meeting of IDCNS, September 1982, nine nomenclature documents were approved for official IUPAC publication. The new, but not fully tested, publication approval process was reviewed; the important role of Division Presidents in the process was stressed. ‘‘Provisional’’ will be replaced by ‘‘proposed’’ as applied to nomenclature and symbols documents. The Committee reaffirmed its position that symbols for physical quantities should always be printed in italics in IUPAC recommendations. Collection of IUPAC-approved glossaries and terminology has been completed; preparation of a consolidated list of entries with references is underway with the ultimate goal of melding the glossaries into a single publication.

**Robert B. Fox**

## Committee on Teaching of Chemistry (CTC): Lyngby, Denmark, 19–20 August 1983

References are given to the minutes of our meetings in Ljubljana (1977), Cassis (1978), Dublin (1979), Ljubljana (1980), Leuven (1981), Montpellier (1982).

1. It was agreed that the minutes of the last meeting of the Committee were a correct record.

2. *International Newsletter on Chemical Education*
   (a) It was noted that Newsletters Nos. 18 and 19 were published in December 1982 and July 1983. The Committee thanked Prof. Paoloni for his help in producing the two Newsletters which were devoted to microcomputers in chemical education.
   (b) It was noted that a new contract with UNESCO had been signed enabling the Committee to publish issues Nos. 19 and 20 (December 1983).
   (c) It was noted that the Royal Society of Chemistry, the Japanese Chemical Society and the South African Chemical Institute had agreed to help with the funding of the next issue. This followed help with the previous issues from the American Chemical Society, the Japanese Chemical Society and the Gesellschaft Deutscher Chemiker.
   (d) The Chairman emphasized that any article published in the Newsletter may be used by National Representatives and others in their national journals or newsletters. Acknowledgements to the Committee should be given and the Chairman informed.
   (e) It was agreed that issues in which the principal part of the Newsletter was devoted to a specific subject should be encouraged.

3. *Chemistry International*
Prof. Paoloni agreed to be the representative of CTC on the Editorial Advisory Board of *Chemistry International* (CI). It was agreed that, at present, CTC would not wish the Newsletter to be absorbed into CI but it would wish to encourage publication of its work and of other educational news of interest to IUPAC members.

4. *Teaching School Chemistry* (77/5, 78/17, 79/12, 80/9, 81/8, 82/9)

It was noted that the book was with the Publication Unit of UNESCO and would be published simultaneously in Arabic, English, French and Spanish.

5. **6th International Conference on Chemical Education, Maryland, 1981** (82/17, 82/18).

The Committee received a paper prepared by the Chairman and Secretary on progress made by CTC on implementing the resolutions of the 6th ICCE. The paper was being sent to each participant of the 7th ICCE (in English or French) asking for help in both policy-making and in implementation.

It was noted that Prof. Gardner gave lectures in India in January 1983 (Hyderabad, Bangalore, Delhi and Chandigahr) describing the work of the Conference and distributing copies of the *Source Book* and *Proceedings*.

6. **7th International Conference on Chemical Education. Montpellier, 1983** (83/19)

The Secretary, who is Conference Organizer, gave a short report. The Proceedings will be published in 1984 and copies sent to National Representatives.

7. **8th International Conference on Chemical Education. Tokyo, 1985** (83/20)

The Committee were informed that following no adverse reply from National Representatives to the Chairman's letter, the Chairman had welcomed, on their behalf, the invitation to hold the 8th ICCE in Tokyo and had been in correspondence with Prof. Shimozawa.

In the absence of Prof. Shimozawa, Prof. Tamaru gave a short report on the planning of the Conference. The Committee emphasized that the Conference should have the following characteristics:

(i) be participatory in nature;
(ii) be attractive to secondary and tertiary level teachers;
(iii) contain lectures from school and college teachers as well as university teachers and others;
(iv) be of interest to teachers from developed and developing countries;
(v) be economically priced so that school teachers can participate.

The Chairman explained that Professor Oki, who was likely to be Conference co-Chairman with him, would be discussing the Conference with him and the Secretary during the 7th ICCE.

8. **Safety Procedures in Schools** (81/23, 82/16).

The Committee welcomed the booklet (8 pp) produced by Mr. Hitchings and agreed that it should be discussed at the appropriate workshop at the 7th ICCE. It was also agreed that, following the workshop and possible modifications made by Mr. Hitchings, the booklet should be sent for comments to National Representatives who will be asked to seek advice from experts in their country.

9. **Culture based approach to chemical education** (81/11, 82/15).

Prof. Paoloni presented his paper on *Mathematics and Chemistry* and asked for comments from members of CTC, in particular on possible starting points for future activities by CTC.

10. **Project for an integrated approach to university teaching of chemistry** (81/9, 82/12). The

Committee noted the report prepared by Prof. Newbold. It also noted that Prof. Newbold would conduct a seminar at the 7th ICCE (83/7).

11. **Simple experiments** (81/10)

The Committee received a proposal from Prof. Guerrero for a book which would have simple experiments for use by teachers but regretfully felt that it would find it difficult to obtain the necessary funding from international sources.

12. **Maintenance of an international roster** (82/7)

Profs. Gardner and Isuyama agreed to consider whether it was possible for rosters for individuals engaged on specific topics to be prepared, bearing in mind the various criticisms made during the discussion.

13. **Problems of conversion to SI units and its effect on the teaching of chemistry** (77/7, 78/9, 79/8, 80/7, 81/6, 82/10).

The Committee received the final reports from Prof. Newbold. Copies of the reports are obtainable from him.

14. **Locally-produced equipment** (79/7, 80/8, 81/15, 82/10).

The Committee received a report on the IUPAC/UNESCO project. Under Dr. Sane the group at the University of Delhi has developed pH meters, conductometers, a polarimeter and a stirrer for use in chemistry teaching laboratories. Regional workshops have been held in Chandigahr, India (participants from India, Bangladesh) in January 1983. Another workshop was held in Sao-Paulo, in July 1983 (participants from Argentina, Bolivia, Brazil, Chile, Peru, Uruguay, Venezuela) and a further one in Georgetown, Guyana (participants from the Carribean) in August 1983. That month a workshop in Copenhagen (participants from 18 countries) was also held.

Prof. Giesbrecht gave a report on the Sao-Paulo workshop which he and Prof. Isuyama organized and their work was welcomed by the Committees. Prof. Khodair expressed interest in holding a workshop in the Arab region. It was noted that workshops would be held during 1984 and 1985 in Bangladesh (Workshop Director: Prof. S. Z. Haider) and Sri Lanka (Workshop director: Prof. R. A. Ramakrishna).

Dr. Sane was congratulated on being the recipient of the first Commonwealth Foundation Visiting Practitionership Award in 1983, which enabled him to organize short workshops and to give lecture demonstrations in Sri Lanka, Papua-New Guinea, Singapore, Malaysia and Bangladesh.

15. **Collaboration with UNESCO.**

Dr. Kingston gave a report on the work of the Division of Science Research and Higher Education of UNESCO, and emphasized the collaboration with IUPAC/CTC in the programme on locally-produced equipment (14) and in arranging the 7th ICCE (6).

16. **Collaboration with ICSU/CTS** (Committee on Teaching of Science).

The Chairman reported on the programme on technician training being implemented by ICSU/CTS and IUPAC/CTC, in collaboration with UNESCO. He drew attention to the publication *International Newsletter on Science Technician Training,* copies of which can be obtained from him.

The Chairman also drew attention to the forthcoming meeting in Bangalore, India, in August 1985. It is entitled "Science and Technology Education and Future Human Needs". He reminded members that CTC was invited to participate and that individuals should write to group leaders to offer help and to suggest names of other participants.

17. **Collaboration with IOCD** (International Organization for Chemical Sciences in Development).

It was agreed that there must be active collaboration and the Chairman and Prof. Kornhauser agreed to explore ways in which this may be accomplished. One specific proposal, that of a joint workshop on locally-produced equipment to be held during 1984, was welcomed.

18. **Collaboration with FECS** (Federation of European Chemical Societies) **WPCE** (Working Party on Chemical Education).

Prof. Chastrette agreed to continue as the representative of CTC on the Working Party.

19. **Other regional organizations**

The Chairman reported that AFSAU (Association of Faculties of Science of African Universities) had been invited to help in the planning of the 7th ICCE (6) and that it was hoped that FACS (Federation of Asian Chemical Societies) would play a similar role at the 8th ICCE (7).

20. **Collaboration with other IUPAC Commissions**

It was noted that no further information had been received from the Commission of Photochemistry (Division of Organic Chemistry) concerning their proposed publication on the teaching of photochemistry.

It was reported that the Commission of Atomic Weights and Isotopic Abundances (Division of Inorganic Chemistry) has produced a new 4-figure table of atomic weights for use in schools at our request. The Chairman expressed his thanks on behalf of CTC. Copies of the Tables will be sent to National Representatives.

Prof. Gardner was invited to represent IUPAC/CTC at the executive meeting of CHEMRAWN during the General Assembly.

21. **Future activities**

The following list summarises the present and future activities, with a note of the members and National Representatives at present responsible for them.

TO REPRESENT IUPAC AT THE INVITATION OF THE PRESIDENT:

Representative on FECS/WPCE .............. M. Chastrette
Representative on ICSU/CTS ............ D. J. Waddington
Representative on COSTED .............. D. J. Waddington

TO REPRESENT IUPAC/CTC ON THE FOLLOWING IUPAC COMMITTEES:

Editorial Advisory Board, *Chemistry International*
L. Paoloni
Teaching Committee, Clinical Chemistry ........ D. Samuel

TO LIAISE, ON BEHALF OF IUPAC/CTC, WITH THE FOLLOWING ORGANISATIONS:

IOCD (Chemical Education)
A. Kornhauser, M. Gardner
ICSU Bangalore Conference 1985 Planning Committee
M. Chastrette
CHEMRAWN ..................................... M. Gardner

TO LOOK AFTER THE FOLLOWING ACTIVITIES:

Editing *International Newsletter* ......... D. J. Waddington
Organizing, on our behalf, news for *J. Chem. Ed.*
J. J. Lagowski
Arrangement for 8th ICCE ............... D. J. Waddington,
M. Chastrette and J. T. Shimozawa
Chairman of the Integrated Chemistry Subcommittee
B. T. Newbold*
Chairman of the Locally-produced Equipment
Subcommittee ................................... K. V. Sane*
Chairman of the "Safety in Schools Booklet"
Subcommittee .............................. T. R. Hitchings*
Chairman and members of the Microcomputer in
Chemical Education Subcommittee
L. Paoloni (Chairman)
A. Kornhauser, M. Chastrette
and J. T. Shimozawa
Maintenance of a roster of chemical educators
R. Isuyama
Editing a technician book ................. D. J. Waddington

*With power to co-opt, in consultation with the Chairman and Secretary of IUPAC/CTC.

Prof. Gardner has agreed to look at long-term finance funding on behalf of CTC

---

## Inorganic Chemistry Division Committee: Lyngby, Denmark, 20–22 August 1983

### Division President's report

The President gave short reports on the meetings of the Executive Officers in Budapest and Seattle and noted that seven international conferences held in 1982 and 1983 had been approved for IUPAC sponsorship by the Inorganic Chemistry Division:

(a) 7th International Conference on Solid Compounds of Transition Elements, Grenoble, France, 21–25 June 1982
(b) 6th International Symposium on Solute–Solute–Solvent-Interactions, Osaka, Japan, 4–10 July 1982

(c) 8th International Conference on Nonaqueous Solutions, Nantes, France, 19–23 July 1982
(d) 22nd International Conference on Coordination Chemistry, Budapest, Hungary, 23–27 August 1982
(e) 2nd International Conference on the Science and Technology of Zirconia, Stuttgart, FRG, 21–23 June 1983
(f) 1st International Conference on Bioinorganic Chemistry, Florence, Italy, 13–17 June 1983
(g) 5th International Symposium on Boron Chemistry, Swansea, UK, 11–15 July 1983

The President reported details of a proposal for an IUPAC Commission on Chemical Kinetics. The 'lead' Division would be the Physical Chemistry Division. The Inorganic, Organic and Macromolecular Chemistry Divisions would have one appointed member each, the Physical Chemistry Division two members, and there would be one 'at-large' member. The Vice-President of the Division was given the responsibility of providing appropriate nominees from Division II.

The Division has been asked for representatives to be members of a new Interdivisional Commission on Radiochemistry and Nuclear Techniques for which the Analytical Chemistry Division is designated as 'lead' Division. The President suggested that Prof. Roth should take part in the Task Group formed to draw up detailed proposals for the new Commission. As possible members of the Commission, Profs. Myasoedov, Foos, and R. Rodriguez-Pasqués were mentioned.

Future activities of the Division were discussed. In the field of Bioinorganic Chemistry the Clinical Chemistry group would like to cooperate with our Division. A proposal will be prepared during the period 1983–1985 as discussed with Prof. Sundermann. The Inorganic Chemistry Division would be the 'lead' Division.

Prof. E. Fluck, Secretary, Division II

## Reports of Commission Chairmen

**Commission II.1** (Atomic Weights and Isotopic Abundances)
It was agreed to disband the Subcommittee on the Assessment of Isotopic Composion (SAIC) after finishing its task. The Commission has completed its review of the *Table of Atomic Weights to Four Significant Figures* at the request of the Committee on the Teaching of Chemistry, which will disseminate this table to schools and publishers. It will continue to monitor and evaluate the published literature on atomic weights, atomic masses and isotopic abundances for both terrestrial and non-terrestrial materials, and for new methods and techniques of measurement. A topic entitled Error Analysis and Uncertainties was added to the project program. The customary press release of the Commission has been prepared mentioning the 12 changes in either atomic weight or accuracy reported. The Commission pointed out that work on these efforts involves a significant cost in time and finances by members and their host institutions. For the eight years' effort by SAIC, it was reported that this cost exceeded IUPAC support by a factor of ten.

**Commission II.2** (Nomenclature of Inorganic Chemistry)
The preparation of the new edition of *Nomenclature of Inorganic Chemistry,* the so-called 'Red Book', has made good progress. The manuscripts of the various chapters are expected to be ready for publication by the end of 1985. The Division Committee agreed that a chapter on the nomenclature of macromolecular compounds should be published in the Red Book in addition to its publication in the 'Purple Book' (*Nomenclature of Macromolecular Compounds*).

**Commission II.3** (High Temperature and Solid State Chemistry)
The manuscripts for *The Handbook on Thermodynamic and Transport Properties of Alkali Metals* will be ready by the end of 1984. The 1500-page book will consist of 66 chapters written by 80 authors. Some of the projects being worked on are: Recommendations for Fabrication and Operation of Zirconia-based Oxygen Gauges, Characterization and Terminology of Carbon, Carbide–Graphite Secondary Temperature Standards, Classification of $Si_3N_4$, Ionic Conductivity of Fluorite-structured Oxides, and Nomenclature of Solids.

## Elections

In a joint meeting of the Division Committee of the Inorganic Chemistry Division and the Titular and Associate Members of all of its Commissions the election of the members of the Division Committee took place. New members of the Division Committee (1983–1987) are:

Prof. A. M. Sargeson, Prof. A. B. P. Lever, Prof. R. Hagemann, and Prof. M. T. Beck.

Prof. Greenwood thanked the President for the social hour which was held for the first time after the 'Open Meeting'. The President thanked the members who are leaving IUPAC bodies.

**E. Fluck**

## Commission I.1 — Physicochemical Symbols, Terminology and Units:

Lyngby, Denmark, 20–22 August 1983

### 1. Dissemination of IUPAC Recommendations

Interaction with National Chemical Bodies, concerning the translation and dissemination of the 'Green Book' as well as the use of IUPAC recommendations in schools and undergraduate courses, has led to the following conclusions (14 replies were obtained): Spanish, Chinese, French, Japanese, Czech, Slovak, Hungarian and Russian translations of the 'Green Book' have been published and in some countries appendices have also been translated. Translations of ISO 31/8 and ISO 32 of the International Standard Series also exist.

From these replies, it appears that IUPAC recommendations are generally well announced throughout technical and scientific journals. It was also stated that publishers and referees were advised by the editors to conform to the IUPAC recommendations for any documents and manuscripts which were submitted for publication.

In general, these recommendations are taught to undergraduate students.

Prof. K. Kuchitsu, Chairman, Commission I.1

### 2. Relation with other IUPAC Commissions

The Commission discussed the following document in a joint meeting with Prof. R. S. Hansen, Chairman, Subcommittee on Chemical Physics of Surfaces, Commission I.6: *Surface Chemical Physics Lexicon* prepared by the Surface Chemical Physics Working Group and edited by R. S. Hansen, P. C. Gravelle, J. Haber, M. W. Roberts and K. Tamaru. This document describes the various experimental techniques which are used in characterizing surfaces. A revised draft will be prepared by the Subcommittee and sent to Commission I.1 at a later date.

A report from the Commission on Quantities and Units in Clinical Chemistry: *Nebulizer and flame properties in flame emission and absorption spectrometry* has been sent to Commission I.1 for critical review.

### 3. Abbreviated List of Symbols, Terminology and Units

The Commission discussed publication of an abbreviated list of the most important items of the 'Green Book', which would be useful to chemists, chemistry teachers and students. The basic structure, a tentative time schedule (as soon as possible) and plans for publication were discussed, as well as assignments of the responsibilities and working schedule. Prof. Schuyff is mainly responsible for this project as coordinator.

All the information contained in the 'Abbreviated List' will be taken from the 'Green Book'.

### 4. Revision of the 'Green Book'

The basic structure and policy of the third revision of the 'Green Book' was discussed. The time schedule and plans for publication were agreed as well as the assignment of responsibilities and working schedule. Prof. Kuchitsu, Dr. Kallay and Prof. Homann have formed a Task Group for this project.

Commissions I.2 and I.6 presented a number of suggestions on the revision of the 'Green Book'. Contacts and exchange of information with other IUPAC Commissions and related organizations are planned.

### 5. Commission Membership

Prof. K. Kuchitsu was reelected Chairman of the Commission, and Dr. N. Kallay was elected as Secretary. Dr. K. H. Homann was recommended to continue to serve as Titular Member. The appointment of Dr. I. M. Mills as Titular Member was proposed. Drs. E. R. Cohen and A. Schuyff were also recommended to continue as Associate Members as was the retiring Titular Member, Dr. I. Ansara. The appointment of Prof. R. Alberty as an Associate Member was also agreed.

Continuation of Dr. L. Treindl as the National Representative of Czechoslovakia was approved and Drs. M. A. G. Cecchini and S. P. Koh were accepted as the National Representatives of Brazil and Malaysia, respectively.

Because of other IUPAC responsibilities, Dr. Lide expressed his wish to withdraw from Associate Membership and Drs. A. Perez-Masiá and K. G. Weil terminated their mandates as Associate Members in the Commission. The Commission wished to express grateful thanks and deep appreciation for their continued contribution and services.

**I. Ansara**

---

## Commission II.1 — Atomic Weights and Isotopic Abundances: Lyngby, Denmark, 19–22 August 1983

The Commission met in Lyngby with Dr. N. E. Holden in the Chair. Twelve changes in atomic weight values and uncertainties were recommended and are as follows:

| | | | | | | |
|---|---|---|---|---|---|---|
| Helium | from | 4.00260 | ± 1 | to | 4.002602 | ± 2 |
| Lithium | from | 6.941 | ± 3 | to | 6.941 | ± 2 |
| Boron | from | 10.81 | ± 1 | to | 10.811 | ± 5 |
| Sulfur | from | 32.06 | ± 1 | to | 32.066 | ± 6 |
| Calcium | from | 40.08 | ± 1 | to | 40.078 | ± 4 |
| Scandium | from | 44.9559 | ± 1 | to | 44.95591 | ± 1 |
| Chromium | from | 51.996 | ± 1 | to | 51.9961 | ± 6 |
| Zinc | from | 65.38 | ± 1 | to | 65.39 | ± 2 |
| Gallium | from | 69.72 | ± 1 | to | 69.723 | ± 4 |
| Zirconium | from | 91.22 | ± 1 | to | 91.224 | ± 2 |
| Ruthenium | from | 101.07 | ± 3 | to | 101.07 | ± 2 |
| Tin | from | 118.69 | ± 3 | to | 118.710 | ± 7 |

These changes recommended by the Commission were based on a detailed element-by-element review performed by the Commission's Subcommittee for the Assessment of Isotopic Composition (SAIC). A discussion of the reasons for these changes and the detailed *Table of Standard Atomic Weights* will appear as Part 1 of the Commission's full biennial report to be published in PAC.

The Commission adopted the table of isotopic compositions for the elements, and the atomic weights calculated from these compositions, prepared by the SAIC after examination of all the published literature available through August 1983. This table will be published separately as Part 2 of the Commission's 1983 Report to encourage a wider appreciation of the data available on isotopic abundances of the elements.

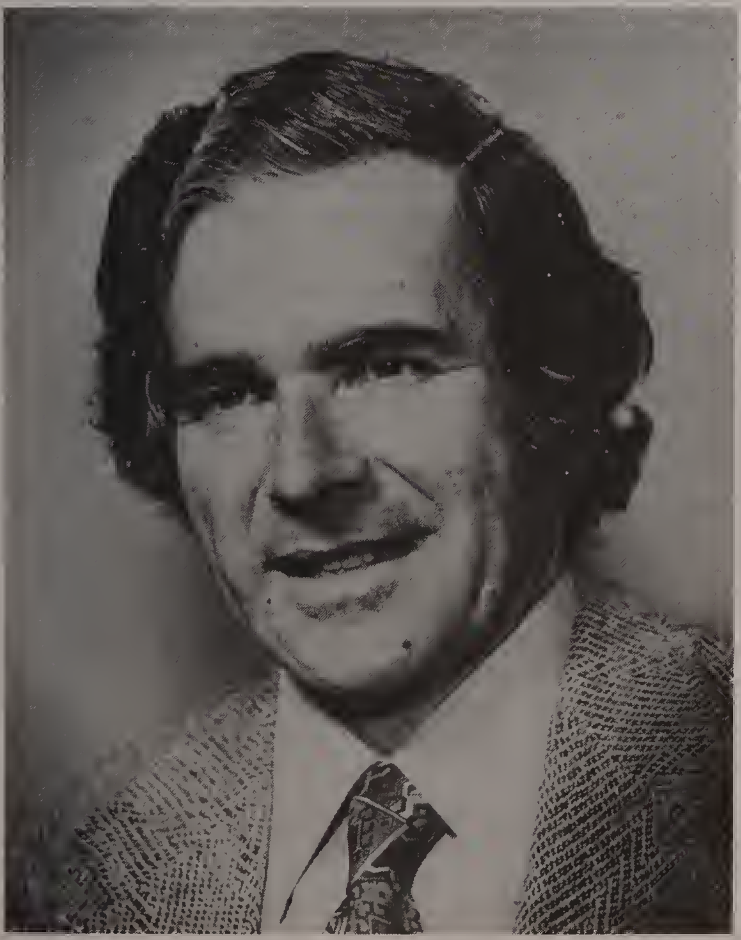
The comprehensive element-by-element review of atomic weight values since 1961 has been completed by the SAIC and approved by the Commission for separate publication in PAC. The successful completion of this massive undertaking over the past eight years has enabled the Commission to disband its SAIC.

The Commission has prepared a revised *Table of Atomic Weights to Four Significant Figures* (scaled to the relative atomic mass of $^{12}C$ = 12 exactly) on behalf of the Committee on Teaching of Chemistry of IUPAC. The tabulated values apply to the chemical elements in their natural terrestrial isotopic composition. To the four-figure precision given, the atomic weights can safely be regarded as constants for teaching purposes.

The Commission has continued to monitor the literature for data on atomic weights, atomic masses and isotopic abundances for both terrestrial and non-terrestrial materials, and for new methods and new techniques for relevant measurements.

The next meeting of the Commission will take place during the 33rd IUPAC Generaly Assembly which wil be held at Écully, a suburb of Lyon, from 30 August to 7 September, 1985.

**R. L. Martin**



Prof. R. L. Martin, Chairman, Commission II.1

## Commission III. 3 — Photochemistry: Lyngby, Denmark, 19–22 August 1983

The Commission considered the report and proposal prepared by Lamola concerning compilations of data for use by the photochemistry community. The proposal, namely that the Commission wishes through the Radiation Chemistry Data Center of the Radiation Laboratory at the University of Notre Dame (USA) to effect appropriate data bases, was endorsed under the proviso that it is made clear that there would be no restrictions on the distribution of the data compilations due to regulations of the US Government agencies that support the Notre Dame facility. Lamola agreed to investigate that point. A working party would be responsible for reviews of data compilations in progress and before final publication. The list of compilations recommended previously by the Commission was reviewed and reaffirmed with minor modification.

The Commission considered the report on *Fluorescence Standards* prepared by Eaton. It was unanimously agreed that the Commission work should emphasize the listing of recommended fluorescence standards and only supply a list of key references to methods. Braslavsky agreed to supply a 'first draft' list of recommended standards.

The Commission considered the report on education in photochemistry submitted by De Schryver. The Commission was split on the questions of the desirability of pursuing an educational project and as to what audience the project should be directed. After a vigorous discussion it was agreed that the general idea presented by De Schryver, namely to address the upper high school and lower undergraduate level by means of supplying short discussions of several key concepts, was sound.

The Commission adopted the provisional document on *Recommended Standards for Reporting Photochemical Data* as final with the proviso that Lamola arranges to incorporate some minor additions suggested by Braslavsky. The Commission reviewed and revised titles in the current draft of the glossary. Prof. Braslavsky will take further charge of this project.

In a joint meeting with the Commission on Physical Organic Chemistry common points of interest in relation to respective glossaries were discussed.

Prof. Lamola and Prof. Wrighton completed their period of membership at the end of the meeting and were thanked for their services to the scientific community and IUPAC. They were replaced by Prof. Braslavsky and Prof. Iwamura as Titular Members. Dr. Heller was appointed as Associate Member.

**F. De Schryver**

## Commission VII.3 — Teaching: Lyngby, Denmark, 19–22 August 1983

Partially as the result of the biennial assessment of the Commission's work made by the IUPAC Vice-President, the Commission members critically examined their present projects. The result of this was a major restructuring based on the fact that the Commission had probably taken on too many projects some of which were inappropriate and others were unlikely to reach a satisfactory completion.

In this context, regionally based programmes would be discontinued as defined IUPAC projects as it was felt these were inappropriate. However, Commission members would continue to maintain an interest in teaching problems in the various regions of the world and to be actively involved in them. The projects on Certification, Licensure and Accreditation, and Self Instruction Material (SIM) have also been discontinued. The former because the requirements for certification, licensure and accreditation vary so much from country to country and are so complex that it was felt no useful conclusions could be drawn. The funding for SIM from the UK Overseas Development Administration has now ceased and the Commission therefore felt that it could no longer include this as an ongoing project, unless further funding became available in the future.

The Commission's final recommendations for a two-year postgraduate course in clinical chemistry have been published [PAC, Vol. 55, pp.557–564 (1983), *J. Clin. Chem. Clin. Biochem,* **21,** 185–191 (1983)], and consequently this project is now considered completed.

A recommended programme for technical personnel has now been finalized and will shortly be submitted to IUPAC and IFCC for publication under the title *A basic education and training framework for medical technicians in clinical chemistry.*

The collection and correlation of reading material continues as an ongoing project, and this is currently maintained by Dr. C. J. Porter, Toronto. Although there have been few requests for any of this material during the last year, the Commission believes its continued assimilation is useful, and Dr. Porter would like to hear from clinical chemists wishing access to the reading list, and to receive contributions of further material, particularly in languages other than English. (Further enquiries should be made through the Secretary).

*Three new projects were initiated at this meeting as follows:*

Drug effects in clinical chemistry: Educational aspects — This is to be a joint project with the IFCC Expert Panel on Drug Effects in which the educational requirements of clinical chemists in understanding the effects of drugs on analyses are considered and training recommendations are made.

Guidelines for teaching clinical chemistry to medical students — Based on a pilot study carried out in Australia to determine the current place of clinical chemistry in medical students' curricula, it is hoped to present recommendations for future medical programmes.

Teaching guidelines for clinical chemists for effective communication of laboratory data — In this project it is hoped to cover all aspects of communication of laboratory data from the use and design of requesting and reporting forms to the importing and storage of analytical results.

Finally, it was noted that the IFCC Education Committee had announced that the arrangements for the appointment of an IFCC Visiting Lecturer had now been made and procedural details sent to Member Societies' National Representatives.

**H. G. J. Worth**

# IUPAC-SPONSORED CONFERENCES

Details of more of the 1984 IUPAC-sponsored Conferences are given below; further information may be obtained from the relevant organizers, see p. 42. Yet again, I appeal to organizers to send me full details of their Conferences as soon as they possibly can so that these appear in good time to alert readers as to the value of attending.

## International Conference on the Physics and Chemistry of Low-dimensional Synthetic Metals, Abano Terme, Italy, 17–22 June 1984

The Conference will take place at the Hotel Terme Alexander in Abano Terme, a small town in the countryside 9 km from Padova. Since ancient times it has been famous as a spa resort. Participants can be accommodated at special rates in the Conference hotel or those very near to it. Registration should have been made before 15 March 1984, the fee being L230 000; after that date an extra L20 000 will be required.

The aim of the Conference is to provide an interdisciplinary forum for discussion of recent experimental and theoretical results in the physics, chemistry and applications of low-dimensional conductors. The programme will consist of invited and contributed lectures and poster sessions. No details are known at the moment. Sessions on the following topics are expected:

Organic superconductors,
Theory of conducting crystals,
New syntheses of conducting crystals,
Structure and properties of conducting crystals,
Transition metal chalcogenides and bronzes,
New syntheses and doping of conducting crystals,
Theory of conducting polymers,
Structure and properties of conducting polymers,
Applications of synthetic metals.

On 19 June the day will be devoted to the International C.N.R. Symposium on Applications and Prospects of Synthetic Metals.

## 6th Bratislava International Conference on Modified Polymers, Bratislava, Czechoslovakia, 2–5 July 1984

The Conference will be held in the Congress Hall of the Hotel Druzba in Bratislava. Accommodation may be reserved in the Druzba residence hall, about 30 minutes bus ride from the city centre, where hotel accommodation can be booked. The Conference fee for active participants is US$95 and should be paid by 15 May 1984; the official language will be English.

The aim of the Conference is to examine advances in the investigation of modified polymers. There are two main topics:

1. Functionalization of polymers, polymer cross-linking, graft and block copolymer synthesis, interaction of free radicals in polymer matrices, thermo- and photo-oxidation of modified polymers especially polyolefins.
2. Properties of modified polymers in bulk and in solution, the effect of additives on these properties, oligomers and polymers as modifiers, polymer composites.

The *main lectures* expected to be given are:

Polymers of functional epoxides and olefins (O. Vogl, USA).
Surface modification and grafting of synthetic fibres and fabrics under cold plasma conditions (C. I. Simionescu, Romania).
Macromonomers and their application for graft polymer synthesis (P. Rempp, France).
Synthesis, structure and properties of liquid crystals (H. Ringsdorf, FRG).
The synthesis of comb branched polymers and their interaction with cations (J. M. G. Cowie, UK).
Structural and chemical modification of liquid crystal polymers (N. A. Platé, USSR).
Interacting polymer blends — synthesis and mechanical properties (H.-A. Schneider, FRG).
Antioxidant mechanism of hindered amine light stabilizers (D. J. Carlsson, Canada).
Reactions of aminyl radicals and mechanism of amine regeneration in inhibition of oxidation (E. T. Denisov, USSR).

Lectures are also to be given by W. Berger (GDR) and N. S. Enikolopyan (USSR) but the titles are not yet known. As well as the above main lectures, there will be a limited number of contributed lectures but most of the contributed papers will be in the form of poster presentations.

## 8th International Congress on Catalysis, Berlin (West), 2–6 July 1984

The Congress programme will include five plenary lectures, about 90 contributed papers and 150 poster presentations, the official language being English. The advance registration fee, estimated at DM 500 including proceedings and supplement, should be paid by 30 April 1984 or a 15% increase will be applied. The scientific programme will be preferentially devoted to topics in heterogeneous catalysis, but subjects related to homogeneous and enzymatic catalysis have been sought, as have those on industrial and technological aspects. Emphasis will be placed on:

Dynamics of catalytic reactions
Impact of surface science on catalysis
Active phase — support interactions

Structure-selectivity/activity correlations
Studies on the working catalyst
New routes for catalyst syntheses
Contributions of catalysis to ensuring energy requirements
Catalysis for reactions with synthesis gas
Catalysis for upgrading of crude oil
Catalysis for synthesis of chemicals
Catalysis and environmental protection
New methods in catalysis research

The Congress will open with the following two lectures:
Euken's work on catalysis (G.-M. Schab, FRG).
The ammonia synthesis and the heterogeneous catalysis. An historical review (B. Timm, FRG).
During the rest of the meeting, five *plenary lectures* will be given —
New approaches to the structural elucidation of zeolitic and related catalysis (J. M. Thomas, UK).
Artificial photosynthesis and solar energy conversion — Photocatalytic water splitting and carbon dioxide reduction (J. M. Lehn, France).
Catalysis and surface chemistry of oxides (J. Haber, Poland).
The surface science view of heterogeneous catalysis. The past, the present and the future (G. A. Somorjai, USA).
Elementary steps in the catalysed conversion of synthesis (W. H. M. Sachtler, USA).

In addition to the above, there are about 70 papers to be read and about 200 poster presentations are expected.

## 26th Prague Microsymposium — Polymers in Medicine and Biology,
Prague, Czechoslovakia, 9–12 July 1984

As is usual with these Prague Microsymposia, all sessions of this one will be held in the Institute of Macromolecular Chemistry of the Czechoslovak Academy of Sciences, pictured on the front cover of this issue. The scope of the Symposium has been defined thus: Results and problems in the research and uses of polymers in medicine and diagnostics, and in biology; relations between the chemical structure of polymer carriers, transfer, stability and accumulation in living organisms; relation between the structure of the polymer surface and haemocompatibility; synthetic analogues of natural polymers. These subjects are organized into four topics —
Soluble polymers and liposomes as targetable drug carriers,
Diagnostic polymers,
Synthetic analogues of natural polymers,
Blood compatability of polymers.

*Invited lectures* (40 min) will include:
Effects of plasma protein adsorption on protein conformation and activity (J. D. Andrade, USA).
Structure, morphology and mechanical properties of soft connective tissues (E. Baer, USA).
Antithrombogenic polymers (M. Jozefowicz, France).
Synthetic polymers for diagnostic purposes (J. Kalal, Czechoslovakia).
Self-regulating insulin delivery systems (S. W. Kim, USA).
Synthetic polymers as targetable carriers for drugs (J. B. Lloyd, UK).
Synthetic analogues of phosphorus-containing biopolymers (S. Penczek, Poland).
Chemistry of macromonomers with physiologically active species and synthesis of polymers for medicine and biochemistry (N. A. Platé, USSR).
Polymeric immunomicrospheres for cell membrane research (A. Rembaum, USA).
Selforganization, membrane activity and surface recognition of polymeric vesicles (H. Ringsdorf, FRG).
Liposomes for drug targeting (V. P. Torchilin, USA).

There are also 16 invited short (20 min) lectures and contributed papers in the form of poster presentations. The official language of the Symposium will be English.

The registration fee, which should have been paid by 15 March 1984, is US$95 but an additional US$15 will be charged for applications received after 15 May 1984. Accommodation can be reserved in halls of residence.

## 14th International Symposium on the Chemistry of Natural Products,
Poznań, Poland, 9–14 July 1984

The Symposium will be based at the Adam Mickiewicz University, Poznań, and is intended to cover all aspects of the chemistry of natural products. The scientific programme will include 14 plenary lectures (1 hr), about 60 section lectures (½hr) — followed by short discussions — and 15 lectures (½hr) in two colloquia. In addition a round table discussion on antiviral agents and interferon is planned. The official language of the Symposium will be English.

The *plenary lectures* to be given are:

Structure function relationship in nucleic acids (F. Cramer, FRG).

Evolutionary biotechnology (M. Eigen, FRG).

Design and construction of biologically active peptides, including enzymes (E. T. Kaiser, USA).

Dynamics of macromolecules (M. Karplus, USA).

DNA from A to Z — a survey of oligonucleotide structures (O. Kennard, UK).

Retinal-based light transducing systems: Bacteriorhodopsin and visual pigments (H. G. Khorana, USA).

Enzyme catalysis: lessons from stereochemistry (J. R. Knowles, USA).

Studies in plant tissue culture. Synthesis and biosynthesis of clinically important and anti-tumour agents (J. P. Kutney, Canada).

The consequences of altering ATP (N. J. Leonard, USA).

Structural studies on bioactive natural products (K. Nakanishi, Japan).

Bioorganic chemistry of polypeptide neurotoxins (Yu. A. Ovchinnikov, USSR).

The genetic engineering of plants with Ti-Plasmids (J. Schell, FRG).

Antiviral agents and their mode of action: Current developments (D. Shugar, Poland).

Biosynthesis: Some unsolved problems (I. D. Spenser, Canada).

Titles of, and topics to be covered in, the five *sections* are:

A. Structure and Properties of Natural Products — The section will deal with isolation, structure elucidation, chemical transformations and structural studies of all classes of natural products except biopolymers.

B. Synthesis and Transformations of Natural Products — Emphasis will be put on: total synthesis of natural products, new methods of organic synthesis applicable to the synthesis of natural products, synthesis and transformation of natural products using enzymes and/or biosystems.

C. Physical and Theoretical Methods in the Structure Elucidation of Biomolecules — Particular attention will be given to X-ray diffraction (single crystals, fibres dynamics of biomolecules), neutron diffraction, chiroptical methods and spectral methods (infrared, Raman, high resolution NMR and mass spectrometry).

D. Bioorganic Chemistry — Special attention will be given to: bioorganic chemistry of amino acids, proteins, nucleosides, phosphates, isoprenoids, acetogenins and alkaloids; enzyme chemistry — chemical approach to enzyme action, enzyme models, metal ions, coenzyme chemistry; mode of action of biologically active compounds, including biomimetic systems.

E. Biopolmyers — Emphasis will be put on: nucleic acids — chemistry, structure and dynamics of nucleic acids, specific interaction with proteins, modified nucleotides in nucleic acids; proteins — glycoproteins, chemistry and function of proteins, conformation and function of proteins; polysaccharides — especially bacterial polysaccharides.

The two *colloquia* will be on:

Organic Crystal Chemistry — newest achievements in diffraction studies of the structure of organic compounds from natural sources and of biological macromolecules.

Genetic Engineering in Agriculture with emphasis on Nitrogen Fixation — recent achievements and prospects of applications of DNA recombinant technology in plant science and agriculture.

*Contributed papers* will be in the form of poster presentations to take place on four afternoons.

Registration fees received by 31 March 1984 will be US$150, after that date US$225. There are special hotel rates and accommodation in students' hostels arranged by ORBIS. The weather should be warm and sunny with average temperatures of 23°C in the day and 15°C at night — but there may be some rain.

Poznań is the capital of Poznań Province, a largely agricultural lowland in the western region of Poland. The city was founded in the 10th Century and became the first Episcopal See and the first capital of Poland. It has several historic monuments and is one of the most well-known cultural and scientific centres in the country; it is surrounded by beautiful forests and lakes.

---

## 27th Prague Microsymposium — Physical Optics of Dynamic Phenomena and Processes in Macromolecular Systems, Prague, Czechoslovakia, 16–19 July 1984

All the domestic details for this Symposium are exactly the same as for the 26th Microsymposium. The scientific programme is very different. This Symposium is designed to present a forum for information exchange between physicists interested primarily in the methods of physical optics and macromolecular scientists who use the methods as tools for the better understanding of dynamic phenomena and processes occurring in macromolecular systems, i.e. changes in molecular conformation and structural order, their properties and interactions. Recent progress and predicted trends in physico-optical methods are to be related to their actual or promising application to macromolecular dynamics and, on the other hand, new or unusual results on dynamic phenomena and processes should be based largely on optical data.

Topics to be covered will include:

1. Conformational changes and interactions of macromolecules in dilute solutions;
2. Dynamic phenomena and processes in macromolecular and colloidal dispersions (both physical and chemical interactions, including ordering phenomena);
3. Dynamic phenomena and processes in concentrated polymer solutions and gels (concerning their structure, properties and interactions, including phase transitions);
4. Dynamic phenomena and processes occurring during formation and transformations of polymer solids (concerning their conformation and structural order, properties and interactions; problem of optical heterogeneities).

The *invited lectures* to be given are —

Light scattering from mixtures of homopolymers and copolymers: theoretical results and experimental examples (H. Benoit, France).

Cooperative motion and self-diffusion in dilute and semidilute PVP solutions determined by com-

bined static and dynamic light scattering (W. Burchard, FRG).
The study of segmental dynamics in bulk polymers by light scattering techniques (T. Dorfmüller, FRG).
Segmental dynamics of chain molecules in polymer solution and melts as studied by quasi-elastic neutron scattering (B. Ewen and E. W. Fischer, FRG).
The dynamic models and computer simulation of local motions showing in polarized luminescence of labeled polymers (Yu. Ya. Gotlib, USSR).
Electro-fluorescent phenomena in macromolecular systems (B. R. Jennings, UK).
Surface enhanced Raman scattering (SERS) of macromolecules on colloidal silver (M. Kerker, USA).
Dynamic light scattering studies of rodlike molecules in polymer systems (R. Pecora, USA).
Quasi-elastic scattering as a diagnostic of single-chain dynamics (W. H. Stockmayer, USA).
Use of circularly polarized light to study biological macromolecules (I. Tinoco, Jr., USA).

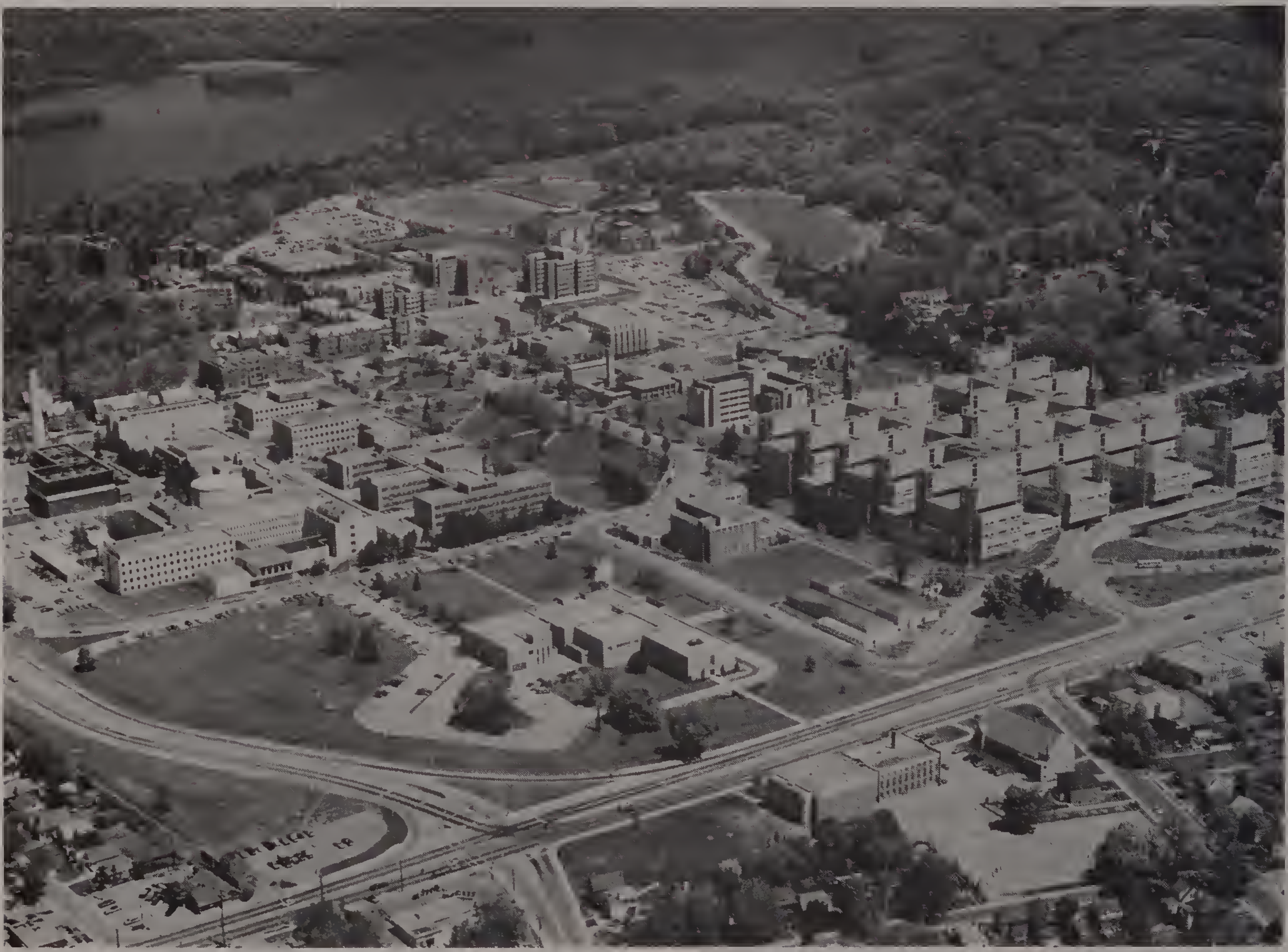
Owing to the large number of high-quality proposals received for short (20 min) lectures it has been decided to extend this facet of the Symposium considerably and a total of 37 of these short lectures will be given. There will, in addition, be poster presentations of original contributions.

## IUPAC Conference on Chemical Thermodynamics, Hamilton, Ontario, Canada, 13–17 August 1984

The Conference will be held on the campus of McMaster University. On-campus, air-conditioned, dormitory-style accommodation can be reserved by those registering before 1 July 1984 but a deposit of CDN$50 (US$40) will be required for such reservation. The fee for the Conference itself is CDN$100 and the official language will be English.

The scientific programme will consist of plenary lectures, invited lectures and other short oral contributions. Poster sessions will only be arranged if the number of contributions submitted does not allow for their oral presentation. The Conference will be organized in a number of symposia, in some of which a plenary lecture will be given. We do not have the titles of these lectures but have given the names of the authors after the title of the relevant symposium —

Thermodynamics of nuclear materials (D. Cubicciotti, USA).
Thermodynamics of binary liquid mixtures (H. Kehiaian, France).
Thermodynamics of organic fossil substances.
Thermodynamics of biochemical and biological systems (P. Von Hippel, USA).
Thermodynamics of energy storage (M. S. Wrighton, USA).
Some thermodynamic aspects of geochemistry.
Thermochemistry and bond enthalpies of organometallic compounds.



**McMaster University campus, Hamilton, Ontario** *(photo courtesy of Tom Bochsler)*

## 23rd International Conference on Coordination Chemistry, Boulder, CO, USA, 29 July–3 August 1984

The Conference will be held at the University of Colorado in Boulder, Colorado. Boulder is situated at the base of the eastern edge of the Rocky Mountains at an altitude of 1660 metres. Accommodation for participants is available in University dormitories — modern and air-conditioned, and limited accommodation in some nearby hotels in which blocks of rooms have been reserved.

The Conference is intended to provide an opportunity for the presentation and discussion of recent research in metal coordination chemistry, to stimulate progress and produce cross-fertilization between subfields in coordination chemistry and to foster new ideas and concepts. The principal form of giving papers will be by poster presentations linked to organized discussion sessions. The main topics to be covered are:

Energetics and dynamics; Catalysis; Bioinorganic; Synthesis; Techniques and applications.

There will be four plenary lectures, titles not known, to be given by A. M. Sargeson (Australia), G. Wilke (FRG), A. Yamamoto (Japan) and R. H. Holm (USA).

## 9th International Conference on Nonaqueous Solutions, Pittsburg, PA, USA, 13–17 August 1984

The Conference will be held in the Chemistry Building of the University of Pittsburg. Accommodation may be booked in one of the University Residence Halls — recently renovated and air-conditioned — about 12 minutes walking distance from the Chemistry Building or in a commercial motor hotel. The Conference fee is US$75 for registration before 15 May 1984; registration will be accepted up to 15 July 1984 but an extra charge will be levied.

The scientific programme will be made up of plenary lectures (50 min), session lectures (30 min), contributed lectures (15 min) and poster presentations, all organized in five sessions —

Structure of solvated ions,
Reactivity of solutes,
Transport properties of electrolytes,
Characterization of solvents and solutes,
Analytical problems in nonaqueous solution chemistry.

The *plenary lectures* to be given are:

Information on ion solvation from the study of ion-solvent molecule equilibria in the gas phase (P. Kebarle, Canada).
Probing ligand substitution in nonaqueous solvents by NMR methods: Stopped-flow and high pressure FTNMR, and natural abundance $^{17}O$ NMR line broadening (P. Moore, UK).
Transport properties of electrolytes from infinite dilution to saturation (J. Barthel, FRG).
Influence of selective solvation on transport properties of electrolytes in mixed solvents (M. Chemla, France).
Analytical problem solving in lithium battery technology (G. Blomgren, USA).

It is interesting to note that the organizers are encouraging participants to send in details of their current scientific interests and recent publications so that this information may be distributed at the Conference.

## IUPAC International Symposium on the Physical Chemistry of Colloids and Macromolecules, Uppsala, Sweden, 22–24 August 1984

The following introduction to the Symposium has been provided by Prof. Bengt Ranby, Chairman of the Programme Committee:

The(odor) Svedberg, born in 1884, was the first Professor of Physical Chemistry in Sweden and a pioneer in colloid and macromolecular research. To celebrate the 100th anniversary of Svedberg's birth, an IUPAC international symposium on The Physical Chemistry of Colloids and Macromolecules will be held at Uppsala University, Sweden. The symposium is sponsored by the Macromolecular Division Committee of IUPAC as a 'single topic' symposium.

The(odor) Svedberg studied at Uppsala University in Sweden from 1903, presented his dissertation on hydrophobic colloids for the Ph.D. degree in chemistry there in 1907 and was Professor of Physical Chemistry at the same university from 1912 to 1949. Svedberg's research from 1904 to 1923 was basic studies on the preparation of hydrophobic colloids, their particle size and size distribution, electric charge, Brownian motion, rate of diffusion and sedimentation and — based on these data — determinations of Avogadro's number and the general gas constant. Svedberg also studied the photographic process related to colloidal silver halides.

The concept *macromolecule* was proposed and verified experimentally during the 1920s. Using the ultracentrifuge, constructed by Svedberg in 1923–1924 for sedimentation studies of colloidal dispersions, Svedberg made the first absolute measurements of the molecular weight (the molecular mass) of macromolecules, for haemoglobin in 1925 and for egg albumin in 1926, which were found to have uniform molecular weights. This result was quite a sensation at the time. Physical chemists had until then considered the proteins to be water-swollen gels or hydrophilic colloids of a rather undefined molecular structure. For his "studies of disperse systems", Svedberg was awarded the Nobel Prize in Chemistry in 1926.

During the following years, ultracentrifugal studies of a large number of 'globular proteins' showed that they were macromolecules of well-defined molecular weight, either monodisperse of uniform molecular weight, or consisting of a few well-defined components (pauci-disperse). Other proteins, e.g. muscle proteins, polysaccharides and polyuronides in plant cells, wood fibres and seed hair, were shown to be heterogeneous (polydisperse) with molecular weight distributions of various width. Synthetic polymers are usually polydisperse, often with a very wide molecular weight distribution.

Svedberg's contributions have been, and still are, of great importance for the development of physicochemical research in several areas. Svedberg and his associates, mainly Kai O. Pedersen, Arne Tiselius and Sven Brohult, made Uppsala an international centre for biochemical research in the 1930s. Physical chemistry was established as a separate department of Uppsala University with its own advanced laboratory building in 1932. Biochemistry became a separate department in 1952 with Arne Tiselius, a student of Svedberg, as department head. Biophysics, which largely deals with native polymers (biopolymers), their structure, conformation and transitions, has its origin in the Svedberg–Tiselius research group. Svedberg's colloidal and surface chemistry research continued into the 1950s, partly in cooperation with Per Ekwall who was appointed as the first director of the *Surface Chemistry Institute* in Sweden in 1968. In wood and cellulose research, another Svedberg group (Nils Gralén, Ingvar Jullander, Bertil Enoksson and Bengt Ranby) did pioneering work, starting in the 1940s, with support from the Swedish pulp and paper industry and later from the Swedish Forest Products Institute in Stockholm. Svedberg contributed to nuclear chemistry and radiation research in cooperation with Helge Tyrén and Gösta Rudstam by construction of a neutron generator and a synchrocyclotron, which became the base for the *Gustaf Werner Institute of Nuclear Chemistry* as a separate department of Uppsala University.

Svedberg's interest in research cooperation with industry was fruitful and of lasting importance. In the 1940s it lead to the establishment of the *LKB Laboratory* and the company *LKB Products Inc.*, which is a successful producer of scientific instruments having subsidiaries in many countries (LKB belongs to the INCENTIVE group in Sweden).

The Svedberg Centennial Symposium will present and discuss selected topics of current interest in colloid and macromolecular research, in relation to the pioneering work of Svedberg and associates. Prof. Herman F. Mark (Brooklyn, NY) will give the introductory main lecture on *Polymer Science in the 1920s* and Prof. Sven Brohult will lecture on *Svedberg as a Scientist*. The following invited main lectures will be held: Prof. A. J. Stavermann (Leiden) on *Sedimentation and Interaction of Macromolecules in Solutions*, Dr. H. Suzuki (Kyoto) on *Sedimentation Analysis of Proteins* and Prof. H. Benoit (Strasbourg) on *Light Scattering Measurements of Macromolecules in Solution*. There will be invited short lectures on research progress in the 'Svedberg areas', by Prof. P. Stenius on *Colloids and Surface Sciences*, Prof. K. O. Pedersen on *Proteins*, Dr. I. Jullander on *Polysaccharides*, Prof. P. O. Kinell on *Synthetic Polymers* and Prof. B. Larsson on *Radiation and Isotope Applications*.

Participants in the Svedberg Symposium are invited to present oral contributions (15 min) and posters in the areas indicated by the topics of the invited lectures. Preliminary registration should be sent to The Svedberg Symposium, Uppsala University, Box 256, S-751 05 Uppsala, Sweden. The First Circular was distributed in November 1983 and the Second Circular containing the scientific and social program, was mailed in February 1984.

The registration fee is 400 SEK. Accommodation is available in student dormitories or in adjacent hotels.

# Science and Technology Education and Future Human Needs

A major international conference with the above title will be held in Bangalore, India, 8–15 August 1985. It is being organized by the ICSU Committee on the Teaching of Science on which Prof. D. J. Waddington, Chairman of CTC, sits as the IUPAC representative.

The principal aim of the conference is to identify practical ways in which science and technology education can contribute to national development. The intention is to collect and evaluate teaching and learning materials and to identify methods for use at all those levels of education that can promote development — post-graduate to primary, including teacher training, adult education and the promotion of public awareness.

Work at the conference will be divided into eight specific topics all of which are concerned with both education and national development. These are:

> Health; The Use of Land, Water and Mineral Resources; Food and Agriculture; Energy Resources; Industry and Technology; The Environment; Information Technology and Transfer; Ethics and Social Responsibility.

A separate group will be responsible for each of these topics which cross the traditional boundaries of physics, chemistry, biology, geology, etc. and it is expected that contributors to each topic will come from many disciplines. Further information can be obtained from Mr. J. L. Lewis, Malvern College, Malvern, Worcestershire WR14 3DF, UK.

**Old University Building, Uppsala** *(photo courtesy of Fred Eklöw)*

**Martin Luther King's Place, Uppsala** *(photo courtesy of Uppsala Bild)*

**Main Building, Uppsala University** *(photo courtesy of Fred Eklöw)*

# More about The Netherlands and Utrecht

The 12th International Carbohydrate Symposium was mentioned in CI, 1984, No.1, pp. 52–53 but additional background material supplied by Dr. J. P. Kamerling had to be omitted due to (an estimated) lack of space. It is reproduced here for the benefit of prospective participants in the Symposium and anyone else thinking of visiting The Netherlands and Utrecht.

## History of The Netherlands

Late in the Middle Ages the Northern Netherlands formed a loose political entity with the Southern Netherlands, which more or less coincided with the Belgium of today. Under Emperor Charles V The Netherlands became part of the Spanish monarchy. Charles' son attempted to turn the self-governing regions and cities into a centrally administered state with the assistance of Spanish governors. This gave rise to a revolt which developed, under the leadership of Prince William of Orange, into the Eighty Years War (1568-1648). From this struggle the Republic of the Seven United Netherlands emerged as an independent nation. In the 17th century, the Golden Age, the country flourished greatly in many fields including commerce, seafaring, arts and science. After the French occupation by Napoleon, the Kingdom of The Netherlands, a constitutional monarchy under the House of Orange, gradually developed into a parliamentary democracy.

All over the world The Netherlands, frequently called Holland, is known as a flat country. The area of the country amounts to some 41 000 km$^2$. More than half of this area lies below sea-level, e.g. Amsterdam International Airport Schiphol at – 4 m. Almost 20% consist of lakes, rivers and canals. The Netherlands has over 14 million inhabitants. With a population density of over 410 persons per km$^2$.The Netherlands is the world's most densely populated country. A major part of the Dutch population lives in the so-called Conurbation Holland area on the North Sea coast. In this area are the largest cities: Amsterdam, the nation's capital; The Hague, seat of the Government; Rotterdam, the world's largest harbour.

Water has always played an important role in Dutch history. Holland's struggle against the sea has given it world fame and the Dutch polders with their windmills, the Delta Project and the Zuiderzee Enclosure Dam are silent witnesses to that effect. Owing to the reclamation of land from the water, the country's area has increased considerably over the years.

## Utrecht — Heart of The Netherlands

The written history of Utrecht begins with the river Rhine and the Castellum Romanum (fortress). The Rhine marked the border of the Roman Empire at the time of the Emperor Claudius. The fortress was founded on what is now called Cathedral Square ("Domplein"). Such fortresses were initially made of timber, later ones were built of stone.

Where once the tramp of Roman legionaires had resounded, Christian services were celebrated a few centuries later. Before the bishops had established themselves as secular rulers, Utrecht being on the edge of the Friesian and Frankish kingdoms, was often the scene of bitter struggles. Amidst all this unrest many churches were built in Utrecht, often enlarged or replaced by new ones. In the 11th century a cross of churches was erected around the already existing Cathedral. In 1254 the building of the present Cathedral ('Domkerk'), with its famous tower rising high above the city, was started. The church was never completed. In 1674 the church was separated from the tower by a cyclone, which also caused heavy damage elsewhere in Utrecht.

Utrecht, which received its Charter in 1122, soon became a reputed centre of trading activities, on which German, Scandinavian and Flemish trade converged. The city formed an important link in the communications between North Germany, Bruges, Westphalia and Holland. In the 13th century the big international shipping trade passed through one of the main canals of Utrecht, the 'Oudegracht'.

Nowadays, Utrecht has grown into a city having about 230 000 inhabitants. Besides the old inner town with its narrow winding canals, its unique dockyard cellars, its churches, the university buildings and the various museums, Utrecht possesses one of Europe's largest and most modern undercover shopping centres 'Hoog-Catherijne'. The State University of Utrecht, founded in 1636, is the largest in The Netherlands. Many national organizations have chosen Utrecht as the location of their corporate headquarters. The Jaarbeurs Congress Centre facilities are situated in the centre of the city.

## State University of Utrecht

Until 1575 young people in the Northern Netherlands had to travel to Louvain in Belgium or to Cologne in Germany for their academic training. In that year the North got its first University, in Leiden.

Several attempts had been made to establish a University in Utrecht. In 1474 a Latin School was founded, supported by the city authorities. The foundation of an 'Illustre School' was the next step, which offered possibilities to study Theology, Law and Philosophy. Amongst the five professors the calvinist Voetius was the most important scholar. Thanks to him in 1636 the School could be transformed into a University and at the same time a

**The 'Dom' tower of Utrecht** *(photo courtes of Foto Dienst Gemeente Utrecht)*

**The Utrecht Jaarbeurs Congress Centre** *(photo courtesy of Fotodienst Schipper B.V.)*

Medical Faculty was also added. The motto chosen was: *Sol Iustitiae Illustra Nos* (The Sun of Justice may Illuminate Us).

During the French occupation the Utrecht University was reorganized as an 'Ecole Secondaire' only. In 1813, after the French had left, the university was restored into its rights and in 1815 the Government of The Netherlands decided to transform this City University into a State University. The Faculty of Philosophy was divided into two faculties, a new one of Philosophy and one of Mathematics and Physics. The Professor of Chemistry G. J. Mulder (1802-1880) became well-known for his introduction of the term 'protein'. Furthermore, the physiologist F. C. Donders (1818-1889) was famous because of his contributions in the field of Ophthalmology. In 1878 Dentistry was added, in 1925 the Faculty of Veterinary Science, and in 1963 the Faculty of Social Sciences.

A new academy building was erected in 1894 on the 'Domplein', next to the first official building of the university — the still existing auditorium in which the 'Union of Utrecht' was signed in 1579. It serves a number of represenative, educational and social purposes. Because of the lack of space, in 1953 the Utrecht University started a building project at the eastern edge of the city, called 'De Uithof'.

At present the State University of Utrecht employs about 7000 people including 400 professors serving 24 000 students. The University is housed in about 150 buildings distributed between the centre of the city and 'De Uithof'.

## Jaarbeurs Congress Centre

The Jaarbeurs Congress Centre forms part of the Royal Netherlands Industries Fair (RNIF) ('Konin klijke Nederlandse Jaarbeurs'), founded in 1916. The RNIF is one of the most experienced trade organizations, and is a founder member of the 'Union des Foires Internationales', the international association of exhibition organizers. It has an extremely modern and completely equipped exhibition site. The total available undercover net standspace is 100,000m$^2$. Up-to-date facilities exist for exhibitions, congresses and conferences. The RNIF complex in Utrecht is situated next to Utrecht Central Railway Station.

Further details of the Symposium itself, not available in time for the earlier announcement, may be of interest — Registration fees: before 15 March, Dfl 500; after that date, Dfl 650. The official Symposium language will be English. The average day temperature in July is 21°C, varying between the extremes of 12°C and 30°C. It may rain.

---

# Recommendations on Nomenclature and Symbols

The national/regional centres that had already been agreed at the time of publication were listed in CI, 1983, No. 5, p. 43. You will remember that, under the provisions of the revised system for comment and approval of IUPAC recommendations, it is from these centres that copies of the provisional recommendations may be obtained for comment. We are now able to announce that four more of these centres have been set up:

**China**
Prof. Bao Yishan, Chinese Chemical Society, POB 2709, Beijing, China.

**Eastern Europe (Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Poland, Romania)**
Prof. E. Pungor, Altalános és Analitikai Kémiai Tanszek, Budapesti Müszaki Egyetem, Gellért tér 4, H-1521 Budapest XI, Hungary.

**France**
Prof. J. Bénard, Maison de la Chimie, 28 rue Saint-Dominique, F-75007 Paris, France.

**USSR**
Prof. G. B. Bokij, Chairman, Commission on Nomenclature, National Committee of Soviet Chemists, Academy of Sciences of USSR, Kosygin Street 4, SU-117977 Moscow V-334, USSR.

In addition, it has now been agreed that Dr. Fritsche (FRG) should act as the regional coordinator for **Austria** as well as for FRG and Switzerland.

# PURE AND APPLIED CHEMISTRY

The contents of the first four issues of 1984 of PAC are, or are expected to be:

| Issue | Pages | Contents | Commission |
|---|---|---|---|
| Vol. 56 (1984) | | | |
| No. 1, January | 1–173 | Plenary and Section lectures presented at the 11th International Conference on Organometallic Chemistry, Pine Mountain, GA, USA, 10–14 October 1983 | |
| No. 2, February | 175–230 | Plenary lectures presented at the 6th International Symposium on Plasma Chemistry, Montreal, Quebec, Canada, 24–28 July 1983 | |
| | | *Commission reports* | |
| | 231–245 | Nomenclature, symbols, units and their usage in spectrochemical analysis — Part VI: Molecular luminescence spectroscopy | V.4 |
| | 247–292 | Critical survey of formation constants of complexes of histidine, phenylalanine, tyrosine, L-DOPA and tryptophan | V.6 |
| | 293–299 | Radiochemical problems of fusion reactors — Part 1: Facilities | V.7 |
| | 301–304 | Results of a collaborative study on determination of erucic acid | VI.3 |
| No. 3, March | 305–460 | Plenary and selected Invited lectures presented at the 29th International Symposium on Macromolecules, Bucharest, Romania, 5–9 September 1983 | |
| No. 4, April | | *Commission reports* | |
| | 461–466 | Recommendations on reporting electrode potentials in non-aqueous solvents *(Recommendations* 1983) | I.3 |
| | 467–477 | Spectrophotometric and fluorimetric determination of amines | V.1 |
| | 479–489 | General aspects of trace analytical methods — Part VI: Acid pressure decomposition in trace element analysis | V.2 |
| | 491–522 | Formation of metal complexes with ethylenediamine: A critical survey of equilibrium constants, enthalpy and entropy values | V.6 |
| | 523–539 | Selected data on ion exchange separations in radioanalytical chemistry | V.7 |
| | 541–547 | Evaluation of the solubility of electrolytes from conductivity measurements | V.8 |
| | 549–566 | Collection, processing and storage of specimens for biological monitoring of occupational exposure to toxic chemicals | VII.4 |

# SCHEDULE OF 1984 MEETINGS OF IUPAC BODIES (as at 1 February 1984)

| IUPAC Body | Location | Date |
|---|---|---|
| **Bureau** | Oxford (UK) | 16–17 September |
| **IUPAC Officers Meeting** | Oxford (UK) | 22–23 June |
| **Division Presidents** | Oxford (UK) | 15 September |
| **CHEMRAWN Committee** | The Hague (Netherlands) | 30 June |
| **Committee on Chemistry and Industry (COCI)** | Arnhem (Netherlands) | 29 June |
| **Committee on Publications** | Oxford (UK) | 1–3 July |
| **Committee on Teaching of Chemistry (CTC)** | | |
| **Finance Committee** | Zurich (Switzerland) | 13–14 February |
| **Interdivisional Committee on Nomenclature and Symbols (IDCNS)** | Oxford (UK) | 10–11 September |
| **IUB–IUPAC Joint Commission on Biochemical Nomenclature (JCBN)** | Bethesda (USA) | 2–4 May |
| **IUB–IUPAB–IUPAC Commission on Biothermodynamics (CB)** | | |
| **Physical Chemistry Division (I)** | | |
| Subcommittee on Physicochemical Measurements and Standards | Paris (France) | September |
| Commission on Physicochemical Symbols, Terminology and Units (I.1) | Darmstadt (FRG) | |
| Subcommittee on Thermodynamic Tables | Hamilton (Canada) | Between 13–17 August during Conference on Chemical Thermodynamics |
| Subcommittee on Transport Properties | London (UK) | 26–27 March |
| Commission on Electrochemistry (I.3) | Lausanne (Switzerland) | |
| Subcommittee on Catalyst Characterization | Berlin (FRG) | |
| **Inorganic Chemistry Division (II)** | | |
| Executive Committee | Boulder (USA) | 30 or 31 July |
| Working Party on Isotopic Composition | Washington (USA) | 26–27 July |
| Commission on Nomenclature of Inorganic Chemistry (II.2) | Paris (France) | 16–20 July |
| Commission on High Temperature and Solid State Chemistry (II.3) | Vienna (Austria) | 6–7 September |
| Subcommittee on Characterization and Terminology of Carbon and Graphite | Bordeaux (France) | Between 2–6 July during Int. Conf. "Carbon '84" |
| **Organic Chemistry Division (III)** | | |
| Commission on Nomenclature of Organic Chemistry (III.1) | Montreal (Canada) | 30 July to 4 August |
| Commission on Physical Organic Chemistry (III.2) | | |
| Commission on Photochemistry (III.3) | Interlaken (Switzerland) | 26–27 July |
| **Macromolecular Division (IV)** | | |
| Division Committee (IV) | Prague (Czechoslovakia) | 13 July |
| Commission on Macromolecular Nomenclature (IV.1) | Prague (Czechoslovakia) | 5–8 September |
| Commission on Polymer Characterization and Properties (IV.2) | Paris (France) | 27–28 September |
| Working Party on Structure and Properties of Commercial Polymers | Delaware (USA) | 2–4 October |
| Working Party on Supported Polymer Films | | |

| | | |
|---|---|---|
| Working Party on Molecular Characterization of Commercial Polymers | Gothenburg (Sweden) | 17 May |
| Working Party on Kinetic Parameters in Free Radical Polymerization | | September |
| **Analytical Chemistry Division (V)** | | |
| Commission on Analytical Reactions and Reagents (V.1) | Krakow (Poland) | 2–3 September |
| Commission on Microchemical Techniques and Trace Analysis (V.2) | Krakow (Poland) | Between 26–31 August during Euroanalysis V |
| Working Group on Organic Trace Analysis | Brussels (Belgium) | 4–5 May |
| Commission on Analytical Nomenclature (V.3) | Washington (USA) | 28 October |
| Commission on Electroanalytical Chemistry (V.5) | (Europe) | October |
| Commission on Equilibrium Data (V.6) | Boulder Colorado (USA) | 31 July–1 August |
| Subcommittee on Stability Constant Data | Boulder Colorado (USA) | 31 July–1 August |
| Commission on Solubility Data (V.8) | London, Ontario (Canada) | 18–20 August |
| Subcommittee on Gas Solubilities<br>Subcommittee on Liquid Solubilities<br>Subcommittee on Solid Solubilities | London, Ontario (Canada) | 18–20 August during period of meetings of V.8 |
| **Applied Chemistry Division (VI)** | | |
| Division Committee (VI) | Washington (USA) | 22–24 October |
| Commission on Food Chemistry (VI.1) | Washington (USA) | |
| Commission on Biotechnology (VI.2) | New Delhi (India) | February |
| Commission on Oils, Fats and Derivatives (VI.3) | Turku (Finland) | 21–23 August |
| Commission on Pesticide Chemistry (VI.5) | Frankfurt (FRG) | July or August |
| **Clinical Chemistry Division (VII)** | | |
| Division Executive Committee | Paris (France) | 1–2 September |
| Commission on Automation and Clinical Chemical Techniques (VII.1) | Barcelona (Spain) | 14–15 October |
| Commission on Quantities and Units (VII.2) | (Switzerland) | October or November |
| Commission on Teaching (VII.3) | (Spain) | |
| Commission on Toxicology (VII.4) | Paris (France) | Between 2–7 September during Int. Conf. on Nickel Metabolism and Toxicology |
| Subcommittee on Environmental and Occupational Toxicology of Nickel | | |
| Subcommittee on Environmental and Occupational Toxicology of Cadmium | Paris (France) | Between 2–7 September during Int. Conf. on Nickel Metabolism and Toxicology |
| Subcommittee on Toxicology of Aluminium | | |
| Subcommittee on Toxicology of Selenium | | |

# A review of visual aids in teaching

**by Dr. H. G. J. Worth**

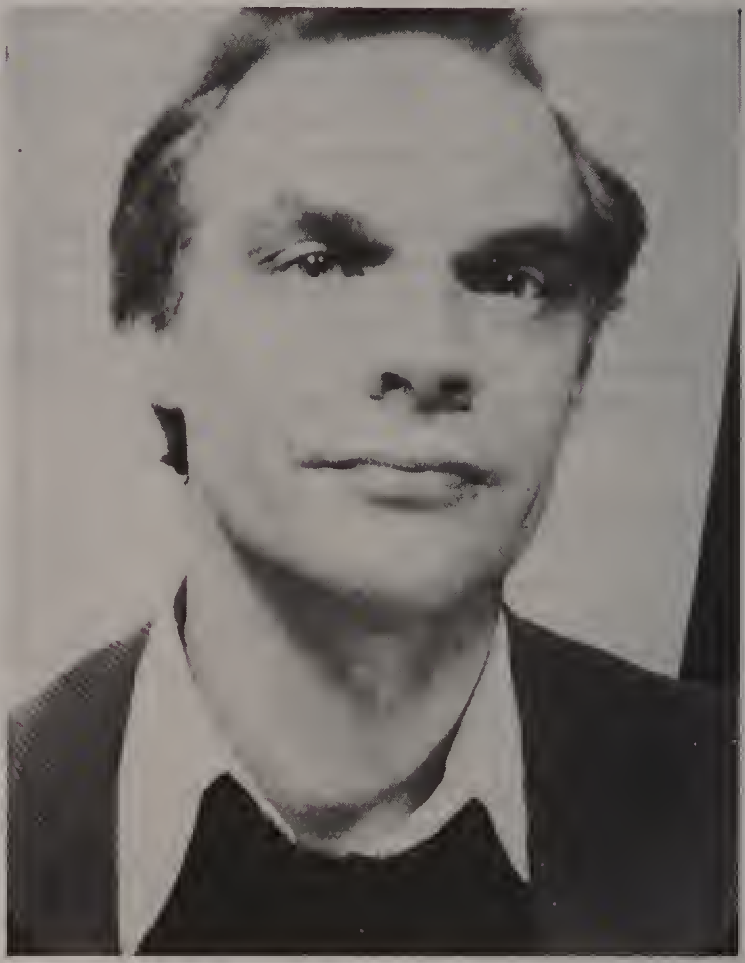
**Commission VII.3**

## INTRODUCTION

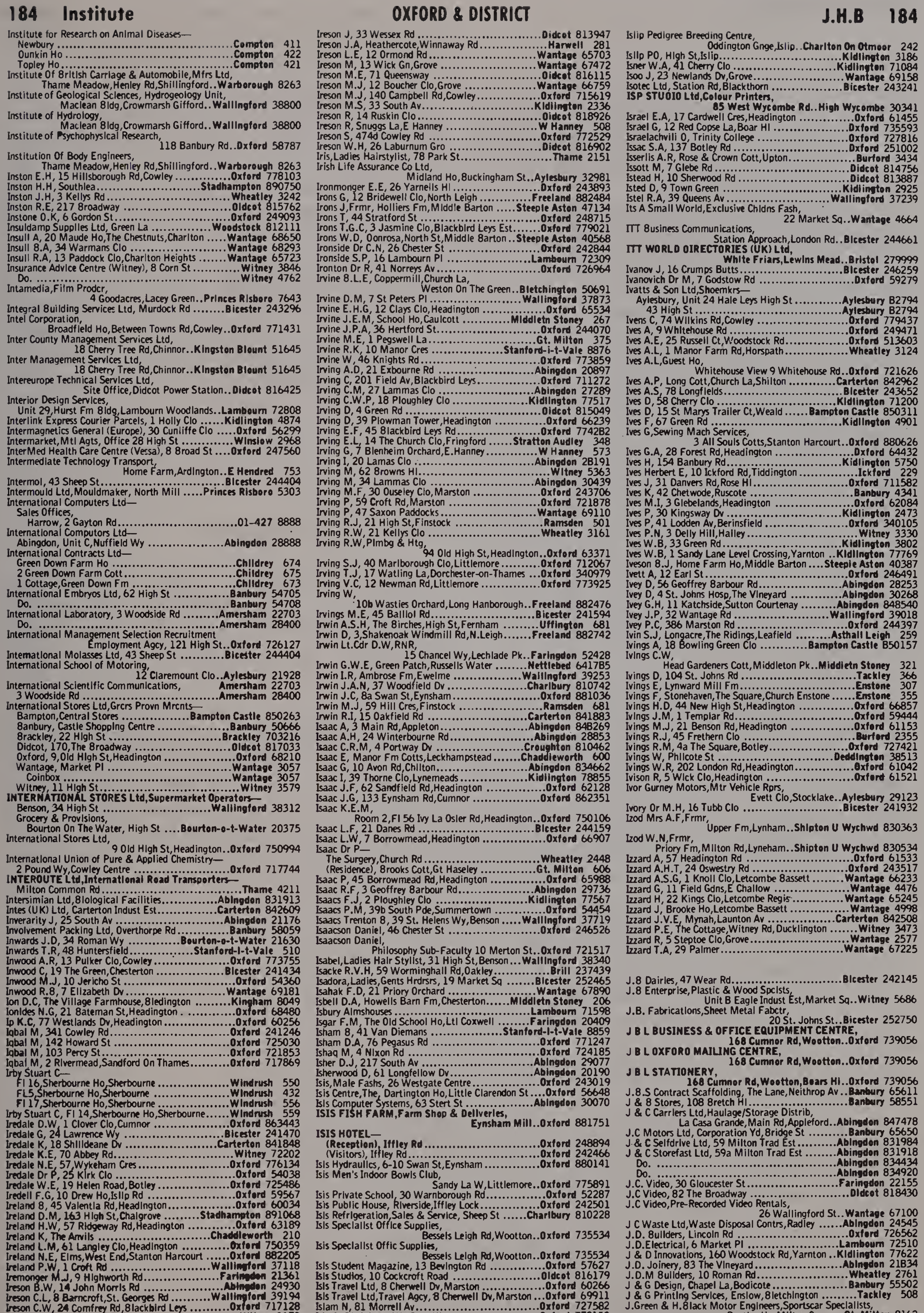
A major component in the presentation of information to an audience is the use of visual aids. This is true whether we are considering a teacher teaching a class of school children, a research student giving an informal seminar on a research project to colleagues, or an eminent expert giving a plenary lecture to a large international audience. It is also true that, although each may be highly competent in the knowledge of the subject at the appropriate level to carry out these very different forms of teaching and education, the individual may frequently have no, or little, training in the use of visual aids and may well have given this aspect of the presentation equally little or no thought.

The purpose of a visual aid, as the name suggests, is to help the presenter in the task of imparting knowledge and information to the audience. It is just an aid with the purpose of expressing ideas or concept and not *all* the information. As such it should not detract from, or hinder, the imparting of information, conflict with that information, or confuse the audience in any way. The written word will obviously play a major part in any form of visual aid, but it must be remembered that the detail required is dependent upon the purpose of that aid. For example, Fig. 1, which is a page extracted from a British Telecom telephone directory, imparts a great deal of information in the form in which it was intended to be presented, but as the subject of a 35mm projector slide, it would be a major distraction to the audience. This example is obvious to the point of being absurd, but how many of us have not made this mistake to a lesser degree at many levels of teaching?

The aim of this article is to review the various forms of visual aids that are available to the potential lecturer and teacher, to point out their salient features and to consider how easily material may be prepared. For those who work in an establishment where there is a good Illustration Department, material is prepared and advice given so that many of the potential problems do not arise. In this situation the advice given by such a Department should never be ignored. The majority of lecturers and teachers are less fortunate and they may have to prepare their own material. This can be done successfully without the best expertise or the most suitable equipment. It may require much time in thought and careful preparation but this is time well spent, because ill-prepared and untidy material will only show a speaker in a bad light and will become a visual hindrance rather than an aid. No speaker should ever present material which he knows is bad. He should therefore never apologize for the quality of his material (because he should never have to), nor should he use phrases such as "I do not expect you to be able to read everything on this slide" or "I know that some of this information is incorrect (not relevant) but . . ." Statements such as these show a disregard to the detail of presentation and are frankly an insult to the audience. Even the most eminent of speakers cannot afford to make this kind of mistake.



Dr. Howard G. J. Worth


184 Institute

OXFORD & DISTRICT

J.H.B 184

Institute for Research on Animal Diseases—
 Newbury ....Compton 411
 Ounkin Ho ....Compton 422
 Topley Ho ....Compton 421
Institute Of 8ritish Carriage & Automobile,Mfrs Ltd,
 Thame Meadow,Henley Rd,Shillingford..Warborough 8263
Institute of Geological Sciences, Hydrogeology Unit,
 Maclean 8ldg,Crowmarsh Gifford..Wallingford 38800
Institute of Hydrology,
 Maclean 8ldg,Crowmarsh Gifford..Wallingford 38800
Institute of Psychophysical Research,
 118 Banbury Rd..Dxford 58787
Institution Of Body Engineers,
 Thame Meadow,Henley Rd,Shillingford..Warborough 8263
Inston E.H, 15 Hillsborough Rd,Cowley ....Oxford 778103
Inston H.H, Southlea ....Stadhampton 890750
Inston J.H, 3 Kellys Rd ....Wheatley 3242
Inston R.E, 217 8roadway ....Oldcot 815762
Instone O.K, 6 Gordon St ....Oxford 249093
Insuldamp Supplies Ltd, Green La ....Woodstock 812111
Insull A, 20 Maude Ho,The Chestnuts,Charlton ....Wantage 68650
Insull 8.A, 34 Warmans Clo ....Wantage 68293
Insull R.A, 13 Paddock Clo,Charlton Heights ....Wantage 65723
Insurance Advice Centre (Witney), 8 Corn St ....Witney 3846
 Do. ....Witney 4762
Intamedia,Film Prodcr,
 4 Goodacres,Lacey Green..Princes Risboro 7643
Integral 8uilding Services Ltd, Murdock Rd ....Bicester 243296
Intel Corporation,
 Broadfield Ho,Between Towns Rd,Cowley..Oxford 771431
Inter County Management Services Ltd,
 18 Cherry Tree Rd,Chinnor..Kingston Blount 51645
Inter Management Services Ltd,
 18 Cherry Tree Rd,Chinnor..Kingston Blount 51645
Intereurope Technical Services Ltd,
 Site Office,Didcot Power Station..Didcot 816425
Interior Design Services,
 Unit 29,Hurst Fm 8ldg,Lambourn Woodlands..Lambourn 72808
Interlink Express Courier Parcels, 1 Holly Clo ....Kidlington 4874
Intermagnetics General (Europe), 30 Cunliffe Clo ....Oxford 56299
Intermarket,Mtl Agts, Office 28 High St ....Winslow 2968
InterMed Health Care Centre (Vessa), 8 8road St ....Oxford 247560
Intermediate Technology Transport,
 Home Farm,Ardington..E Hendred 753
Intermol, 43 Sheep St ....Bicester 244404
Intermould Ltd,Mouldmaker, North Mill ....Princes Risboro 5303
International Computers Ltd—
 Sales Offices,
 Harrow, 2 Gayton Rd ....01-427 8888
International Computors Ltd—
 Abingdon, Unit C,Nuffield Wy ....Abingdon 28888
International Contracts Ltd—
 Green Down Farm Ho ....Childrey 674
 2 Green Down Farm Cott ....Childrey 675
 1 Cottage,Green Down Fm ....Childrey 673
International Embryos Ltd, 62 High St ....Banbury 54705
 Do. ....Banbury 54708
International Laboratory, 3 Woodside Rd ....Amersham 22703
 Do. ....Amersham 28400
International Management Selection Recruitment
 Employment Agcy, 121 High St..Oxford 726127
International Molasses Ltd, 43 Sheep St ....Bicester 244404
International School of Motoring,
 12 Claremount Clo..Aylesbury 21928
International Scientific Communications, Amersham 22703
 3 Woodside Rd ....Amersham 28400
International Stores Ltd,Grcrs Provn Mrcnts—
 Bampton,Central Stores ....Bampton Castle 850263
 8anbury, Castle Shopping Centre ....Banbury 50666
 8rackley, 22 High St ....Brackley 703216
 Didcot, 170,The 8roadway ....Oldcot 817033
 Oxford, 9,Old High St,Headington ....Oxford 68210
 Wantage, Market Pl ....Wantage 3057
 Coinbox ....Wantage 3057
 Witney, 11 High St ....Witney 3579
**INTERNATIONAL STORES Ltd,Supermarket Operators—**
 Benson, 34 High St ....Wallingford 38312
 Grocery & Provisions,
 Bourton On The Water, High St ....Bourton-o-t-Water 20375
International Stores Ltd,
 9 Old High St,Headington..Oxford 750994
International Union of Pure & Applied Chemistry—
 2 Pound Wy,Cowley Centre ....Oxford 717744
**INTEROUTE Ltd,International Road Transporters—**
 Milton Common Rd ....Thame 4211
Intersimian Ltd,8iological Facilities ....Abingdon 831913
Intes (UK) Ltd, Carterton Indust Est ....Carterton 842609
Inverarity J, 25 South Av ....Abingdon 21176
Involvement Packing Ltd, Overthorpe Rd ....Banbury 58059
Inwards J.D, 34 Roman Wy ....Bourton-o-t-Water 21630
Inwards T.R, 48 Huntersfield ....Stanford-I-t-Vale 510
Inwood A.R, 13 Pulker Clo,Cowley ....Oxford 773755
Inwood C, 19 The Green,Chesterton ....Bicester 241434
Inwood M.J, 10 Jericho St ....Oxford 54360
Inwood R.8, 7 Elizabeth Dv ....Wantage 69181
Ion D.C, The Village Farmhouse,8ledington ....Kingham 8049
Ionides N.G, 21 8ateman St,Headington ....Oxford 68480
Ip K.C, 77 Westlands Dv,Headington ....Oxford 60256
Iqbal M, 341 Cowley Rd ....Oxford 241246
Iqbal M, 142 Howard St ....Oxford 725030
Iqbal M, 103 Percy St ....Oxford 721853
Iqbal M, 2 Rivermead,Sandford On Thames ....Oxford 717869
Irby Stuart C—
 Fl 16,Sherbourne Ho,Sherbourne ....Windrush 550
 FL5,Sherbourne Ho,Sherbourne ....Windrush 432
 Fl 17,Sherbourne Ho,Sherbourne ....Windrush 556
Irby Stuart C, Fl 14,Sherbourne Ho,Sherbourne ....Windrush 559
Iredale D.W, 1 Clover Clo,Cumnor ....Oxford 863443
Iredale G, 24 Lawrence Wy ....Bicester 241470
Iredale K, 18 Shilldeane Dv ....Carterton 841848
Iredale K.E, 70 Abbey Rd ....Witney 72202
Iredale N.E, 57,Wykeham Cres ....Oxford 776134
Iredale Dr P, 25 Kirk Clo ....Oxford 54038
Iredale W.E, 19 Helen Road,Botley ....Oxford 725486
Iredell F.G, 10 Drew Ho,Islip Rd ....Oxford 59567
Ireland 8, 45 Valentia Rd,Headington ....Oxford 60034
Ireland D.M, 163 High St,Chalgrove ....Stadhampton 891068
Ireland H.W, 57 Ridgeway Rd,Headington ....Oxford 63189
Ireland K, The Anvils ....Chaddleworth 210
Ireland L.M, 61 Langley Clo,Headington ....Oxford 750359
Ireland N.E, Elms,West End,Stanton Harcourt ....Oxford 882205
Ireland P.W, 1 Croft Rd ....Wallingford 37118
Iremonger M.J, 9 Highworth Rd ....Faringdon 21361
Ireson B.W, 14 John Morris Rd ....Abingdon 24930
Ireson C.L, 8 Barncroft,St. Georges Rd ....Wallingford 39194
Ireson C.W, 24 Comfrey Rd,8lackbird Leys ....Oxford 717128
Ireson D, 61 Burwell Dv ....Witney 3078
Ireson D.A, 40 Lay Av,Berinsfield ....Oxford 340997
Ireson E.A, Land O,Winnaway Rd ....Harwell 593
Ireson F.W, 16 Golden Rd ....Oxford 724457
Ireson H.J, 2 Partridge Clo ....Wantage 3340
Ireson J, 33 Wessex Rd ....Didcot 813947
Ireson J.A, Heathercote,Winnaway Rd ....Harwell 281
Ireson L.E, 12 Ormond Rd ....Wantage 65703
Ireson M, 13 Wick Gn,Grove ....Wantage 67472
Ireson M.E, 71 Queensway ....Oidcot 816115
Ireson M.J, 12 Boucher Clo,Grove ....Wantage 66759
Ireson M.J, 140 Campbell Rd,Cowley ....Oxford 715619
Ireson M.S, 33 South Av ....Kidlington 2336
Ireson R, 14 Ruskin Clo ....Oidcot 818926
Ireson R, Snuggs La,E Hanney ....W Hanney 508
Ireson S, 474d Cowley Rd ....Oxford 772529
Ireson W.H, 26 Laburnum Gro ....Didcot 816902
Iris,Ladies Hairstylist, 78 Park St ....Thame 2151
Irish Life Assurance Co Ltd,
 Midland Ho,8uckingham St..Aylesbury 32981
Ironmonger E.E, 26 Yarnells Hl ....Dxford 243893
Irons G, 12 Bridewell Clo,North Leigh ....Freeland 882484
Irons J,Frmr, Holliers Fm,Middle Barton ....Steeple Aston 47134
Irons T, 44 Stratford St ....Oxford 248715
Irons T.G.C, 3 Jasmine Clo,Blackbird Leys Est ....Oxford 779021
Irons W.D, Oonrosa,North St,Middle 8arton..Steeple Aston 40568
Ironside Dr C.N, 26 Chester St ....Oxford 242844
Ironside S.P, 16 Lambourn Pl ....Lambourn 72309
Ironton Dr R, 41 Norreys Av ....Oxford 726964
Irvine 8.L.E, Coppermill,Church La,
 Weston On The Green..Bletchington 50691
Irvine D.M, 7 St Peters Pl ....Wallingford 37873
Irvine E.H.G, 12 Clays Clo,Headington ....Oxford 65534
Irvine J.E.M, School Ho,Caulcott ....Middletn Stoney 267
Irvine J.P.A, 36 Hertford St ....Oxford 244070
Irvine M.E, 1 Pegswell La ....Gt. Milton 375
Irvine R.K, 10 Manor Cres ....Stanford-i-t-Vale 8876
Irvine W, 46 Knights Rd ....Oxford 773859
Irving A.D, 21 Exbourne Rd ....Abingdon 20897
Irving C, 201 Field Av,Blackbird Leys ....Oxford 711272
Irving C.M, 27 Lammas Clo ....Abingdon 27289
Irving C.W.P, 18 Ploughley Clo ....Kidlington 77517
Irving D, 4 Green Rd ....Oldcot 815049
Irving D, 39 Plowman Tower,Headington ....Oxford 66239
Irving E.F, 45 8lackbird Leys Rd ....Oxford 7742B2
Irving E.L, 14 The Church Clo,Fringford ....Stratton Audley 348
Irving G, 7 Blenheim Orchard,E.Hanney ....W Hanney 573
Irving I, 20 Lamas Clo ....Abingdon 2B191
Irving M, 62 8rowns Hl ....Witney 5363
Irving M, 34 Lammas Clo ....Abingdon 30439
Irving M.F, 30 Ouseley Clo,Marston ....Oxford 243706
Irving P, 59 Croft Rd,Marston ....Oxford 721878
Irving P, 47 Saxon Paddocks ....Wantage 69110
Irving R.J, 21 High St,Finstock ....Ramsden 501
Irving R.W, 21 Kellys Clo ....Wheatley 3161
Irving R.W,Plmbg & Htg,
 94 Old High St,Headington..Oxford 63371
Irving S.J, 40 Marlborough Clo,Littlemore ....Oxford 712067
Irving T.J, 17 Watling La,Dorchester-on-Thames ....Oxford 340979
Irving V.C, 12 Newman Rd,Littlemore ....Oxford 773925
Irving W,
 10b Wasties Orchard,Long Hanborough..Freeland 882476
Irvings M.E, 45 Balliol Rd ....Bicester 241594
Irwin A.S.H, The 8irches,High St,Fernham ....Uffington 681
Irwin D, 3,Shakenoak Windmill Rd,N.Leigh ....Freeland 882742
Irwin Lt.Cdr D.W,RNR,
 15 Chancel Wy,Lechlade Pk..Faringdon 52428
Irwin G.W.E, Green Patch,Russells Water ....Nettlebed 6417B5
Irwin I.R, Ambrose Fm,Ewelme ....Wallingford 39253
Irwin J.A.N, 37 Woodfield Dv ....Charlbury 810742
Irwin J.C, 8a Swan St,Eynsham ....Oxford 881036
Irwin M.J, 59 Hill Cres,Finstock ....Ramsden 681
Irwin R.I, 15 Oakfield Rd ....Carterton 841883
Isaac A, 3 Main Rd,Appleton ....Abingdon 84B269
Isaac A.H, 24 Winterbourne Rd ....Abingdon 28853
Isaac C.R.M, 4 Portway Dv ....Croughton 810462
Isaac E, Manor Fm Cotts,Leckhampstead ....Chaddleworth 600
Isaac G, 10 Avon Rd,Chilton ....Abingdon 834662
Isaac I, 39 Thorne Clo,Lynemeads ....Kidlington 78855
Isaac J.F, 62 Sandfield Rd,Headington ....Oxford 62128
Isaac J.G, 133 Eynsham Rd,Cumnor ....Oxford 862351
Isaac K.E.M,
 Room 2,Fl 56 Ivy La Osler Rd,Headington..Oxford 750106
Isaac L.F, 21 Danes Rd ....Bicester 244159
Isaac L.W, 7 Borrowmead,Headington ....Oxford 66907
Isaac Dr P—
 The Surgery,Church Rd ....Wheatley 2448
 (Residence), 8rooks Cott,Gt Haseley ....Gt. Milton 606
Isaac P, 45 Borrowmead Rd,Headington ....Oxford 65988
Isaac R.F, 3 Geoffrey 8arbour Rd ....Abingdon 29736
Isaacs F.J, 2 Ploughley Clo ....Kidlington 77567
Isaacs P.M, 39b South Pde,Summertown ....Oxford 54454
Isaacs Trenton 8, 39 St. Helens Wy,Benson ....Wallingford 37719
Isaacson Daniel, 46 Chester St ....Oxford 246526
Isaacson Daniel,
 Philosophy Sub-Faculty 10 Merton St..Oxford 721517
Isabel,Ladies Hair Stylist, 31 High St,Benson ....Wallingford 38340
Isacke R.V.H, 59 Worminghall Rd,Oakley ....Brill 237439
Isadora,Ladies,Gents Hrdrsrs, 19 Market Sq ....Bicester 252465
Isahak F.D, 21 Priory Orchard ....Wantage 67890
Isbell D.A, Howells Barn Fm,Chesterton ....Middletn Stoney 206
Isbury Almshouses ....Lambourn 71598
Isgar F.M, The Old School Ho,Ltl Coxwell ....Faringdon 20409
Isham 8, 41 Van Diemans ....Stanford-I-t-Vale 8859
Isham D.A, 76 Pegasus Rd ....Oxford 771247
Ishaq M, 4 Nixon Rd ....Oxford 724185
Isher D.J, 217 South Av ....Abingdon 29077
Isherwood D, 61 Longfellow Dv ....Abingdon 20190
Isis,Male Fashs, 26 Westgate Centre ....Oxford 243019
Isis Centre,The, Dartington Ho,Little Clarendon St ....Oxford 56648
Isis Computer Systems, 63 Stert St ....Abingdon 30070
**ISIS FISH FARM,Farm Shop & Deliveries,**
 Eynsham Mill..Oxford 881751
**ISIS HOTEL—**
 **(Reception), Iffley Rd ....Oxford 248894**
 (Visitors), Iffley Rd ....Oxford 242466
Isis Hydraulics, 6-10 Swan St,Eynsham ....Oxford 880141
Isis Men's Indoor Bowls Club,
 Sandy La W,Littlemore..Oxford 775891
Isis Private School, 30 Warnborough Rd ....Oxford 52287
Isis Public House, Riverside,Iffley Lock ....Oxford 242501
Isis Refrigeration,Sales & Service, Sheep St ....Charlbury 810228
Isis Specialist Office Supplies,
 Bessels Leigh Rd,Wootton..Oxford 735534
Isis Specialist Offic Supplies,
 Bessels Leigh Rd,Wootton..Oxford 735534
Isis Student Magazine, 13 Bevington Rd ....Oxford 57627
Isis Studios, 10 Cockcroft Road ....Oldcot 816179
Isis Travel Ltd, 8 Cherwell Dv,Marston ....Oxford 60266
Isis Travel Ltd,Travel Agcy, 8 Cherwell Dv,Marston ....Oxford 69911
Islam N, 81 Morrell Av ....Oxford 727582
Isle A, 56 Ashurst Wy,Rose Hl ....Oxford 772159
Isle N, 62 Abbey Rd ....Witney 5700
Isler R, The Old Water Mill,Ardington ....E Hendred 371
Isler R, 80,Betterton Cott,Ardington ....E Hendred 700
Isley G, Grange Fl,8urcot ....Clifton Hampden 7381
Islip Pedigree Breeding Centre,
 Oddington Gnge,Islip..Charlton On Otmoor 242
Islip PO, High St,Islip ....Kidlington 3186
Isner W.A, 41 Cherry Clo ....Kidlington 71084
Isoo J, 23 Newlands Dv,Grove ....Wantage 69158
Isotec Ltd, Station Rd,Blackthorn ....Bicester 243241
**ISP STUOIO Ltd,Colour Printers,**
 **85 West Wycombe Rd..High Wycombe 30341**
Israel E.A, 17 Cardwell Cres,Headington ....Oxford 61455
Israel G, 12 Red Copse La,Boar Hl ....Dxford 735593
Israelachvili O, Trinity College ....Oxford 727816
Issac S.A, 137 Botley Rd ....Dxford 251002
Isserlis A.R, Rose & Crown Cott,Upton ....Burford 3434
Issott M, 7 Glebe Rd ....Didcot 814756
Istead H, 10 Sherwood Rd ....Didcot 813887
Isted D, 9 Town Green ....Kidlington 2925
Istel R.A, 39 Queens Av ....Wallingford 37239
Its A Small World,Exclusive Chldns Fash,
 22 Market Sq..Wantage 4664
ITT 8usiness Communications,
 Station Approach,London Rd..Bicester 244661
**ITT WORLD OIRECTORIES (UK) Ltd,**
 **White Friars,Lewins Mead..Bristol 279999**
Ivanov J, 16 Crumps Butts ....Bicester 246259
Ivanovich Dr M, 7 Godstow Rd ....Dxford 59279
Ivatts & Son Ltd,Shoemkrs—
 Aylesbury, Unit 24 Hale Leys High St ....Aylesbury B2794
 43 High St ....Aylesbury B2794
Ivens C, 74 Wilkins Rd,Cowley ....Oxford 779437
Ives A, 9 Whitehouse Rd ....Oxford 249471
Ives A.E, 25 Russell Ct,Woodstock Rd ....Oxford 513603
Ives A.L, 1 Manor Farm Rd,Horspath ....Wheatley 3124
Ives A.L,Guest Ho,
 Whitehouse View 9 Whitehouse Rd..Oxford 721626
Ives A.P, Long Cott,Church La,Shilton ....Carterton 842962
Ives A.S, 78 Longfields ....Bicester 243652
Ives D, 58 Cherry Clo ....Kidlington 71200
Ives D, 15 St Marys Trailer Ct,Weald ....Bampton Castle 850311
Ives F, 67 Green Rd ....Kidlington 4901
Ives G,Sewing Mach Services,
 3 All Souls Cotts,Stanton Harcourt..Oxford 880626
Ives G.A, 28 Forest Rd,Headington ....Dxford 64432
Ives H, 154 Banbury Rd ....Kidlington 5750
Ives Herbert E, 10 Ickford Rd,Tiddington ....Ickford 229
Ives J, 31 Danvers Rd,Rose Hl ....Oxford 711582
Ives K, 42 Chetwode,Ruscote ....Banbury 4341
Ives M.I, 3 Glebelands,Headington ....Oxford 62084
Ives P, 30 Kingsway Dv ....Kidlington 2473
Ives P, 41 Lodden Av,Berinsfield ....Oxford 340105
Ives P.N, 3 Delly Hill,Hailey ....Witney 3330
Ives W.B, 33 Green Rd ....Kidlington 3802
Ives W.B, 1 Sandy Lane Level Crossing,Yarnton ..Kidlington 77769
Iveson 8.J, Home Farm Ho,Middle Barton ....Steeple Aston 40387
Ivett A, 12 Earl St ....Oxford 246491
Ivey D, 56 Geoffrey 8arbour Rd ....Abingdon 28253
Ivey D, 4 St. Johns Hosp,The Vineyard ....Abingdon 30268
Ivey G.H, 11 Katchside,Sutton Courtenay ....Abingdon 848540
Ivey J.P, 32 Wantage Rd ....Wallingford 39018
Ivey P.C, 386 Marston Rd ....Oxford 244397
Ivin S.J, Longacre,The Ridings,Leafield ....Asthall Leigh 259
Ivings A, 18 Bowling Green Clo ....Bampton Castle B50157
Ivings C.W,
 Head Gardeners Cott,Middleton Pk..Middletn Stoney 321
Ivings D, 104 St. Johns Rd ....Tackley 366
Ivings E, Lynward Mill Fm ....Enstone 307
Ivings F, Stonehaven,The Square,Church Enstone ....Enstone 355
Ivings H.D, 44 New High St,Headington ....Oxford 66857
Ivings J.M, 1 Templar Rd ....Oxford 59444
Ivings M.J, 21 Benson Rd,Headington ....Oxford 61153
Ivings R.J, 45 Frethern Clo ....Burford 2355
Ivings R.M, 4a The Square,Botley ....Oxford 727421
Ivings W, Philcote St ....Deddington 38513
Ivings W.R, 202 London Rd,Headington ....8xford 61042
Ivison R, 5 Wick Clo,Headington ....Oxford 61521
Ivor Gurney Motors,Mtr Vehicle Rprs,
 Evett Clo,Stocklake..Aylesbury 29123
Ivory Or M.H, 16 Tubb Clo ....Bicester 241932
Izod Mrs A.F,Frmr,
 Upper Fm,Lynham..Shipton U Wychwd 830363
Izod W.N,Frmr,
 Priory Fm,Milton Rd,Lyneham..Shipton U Wychwd 830534
Izzard A, 57 Headington Rd ....Oxford 61533
Izzard A.H.T, 24 Oswestry Rd ....Oxford 243517
Izzard A.S.G, 1 Knoll Clo,Letcombe 8assett ....Wantage 66233
Izzard G, 11 Field Gdns,E Challow ....Wantage 4476
Izzard H, 22 Kings Clo,Letcombe Regis ....Wantage 65245
Izzard J, Brooke Ho,Letcombe Bassett ....Wantage 4998
Izzard J.V.E, Mynah,Launton Av ....Carterton 842508
Izzard P.E, The Cottage,Witney Rd,Ducklington ....Witney 3473
Izzard R, 5 Steptoe Clo,Grove ....Wantage 2577
Izzard T.A, 29 Palmer ....Wantage 67225

J.8 Dairies, 47 Wear Rd ....Bicester 242145
J.8 Enterprise,Plastic & Wood Spclsts,
 Unit B Eagle Indust Est,Market Sq..Witney 5686
J.B. Fabrications,Sheet Metal Fabctr,
 20 St. Johns St..Bicester 252750
**J B L BUSINESS & OFFICE EQUIPMENT CENTRE,**
 **168 Cumnor Rd,Wootton..Oxford 739056**
**J B L OXFORO MAILING CENTRE,**
 **168 Cumnor Rd,Wootton..Oxford 739056**
**J B L STATIONERY,**
 **168 Cumnor Rd,Wootton,Bears Hl..Oxford 739056**
J.8.S Contract Scaffolding, The Lane,Neithrop Av ..Banbury 65611
J & 8 Stores, 108 8retch Hl ....Banbury 58551
J & C Carriers Ltd,Haulage/Storage Distrib,
 La Casa Grande,Main Rd,Appleford..Abingdon 847478
J.C Motors Ltd, Corporation Yd,8ridge St ....Banbury 65650
J & C Selfdrive Ltd, 59 Milton Trad Est ....Abingdon 831984
J & C Storefast Ltd, 59a Milton Trad Est ....Abingdon 831918
 Do. ....Abingdon 834434
 Do. ....Abingdon 834920
J.C. Video, 30 Gloucester St ....Faringdon 22155
J.C Video, 82 The Broadway ....Didcot 818430
J.C Video,Pre-Recorded Video Rentals,
 26 Wallingford St..Wantage 67100
J C Waste Ltd,Waste Disposal Contrs,Radley ....Abingdon 24545
J.D. 8uilders, Lincoln Rd ....Oxford 726562
J.D.Electrical, 6 Market Pl ....Lambourn 72510
J & D Innovations, 160 Woodstock Rd,Yarnton ..Kidlington 77622
J.D. Joinery, 83 The Vineyard ....Abingdon 21B34
J.D.M 8uilders, 10 Roman Rd ....Wheatley 2761
J & G Design, Chapel La,Bodicote ....Banbury 55502
J & G Printing Services, Enslow,8letchington ....Tackley 508
J.Green & H.8lack Motor Engineers,Sportscar Specialists,
 Bentley Ho,Milton Comm..Gt. Milton 8162
J.H Assurance Consultants—
 Richards Chambers,Exchange St ....Aylesbury 31333
 Do. ....Aylesbury 89594
J.H.8 (Equipment) Ltd, Caldicott Rd ....Abingdon 32799

**Fig. 1. An extract from a British Telecom telephone directory (The author wishes to acknowledge the permission of British Telecom to reproduce this extract).**

## BLACKBOARD

This has traditionally been the visual aid of the school teacher or college lecturer although there is no reason why it should be restricted to these groups. It can certainly be used effectively in more formal presentations.

The blackboard user should be aware of two main pitfalls. Firstly, he must remember that he is teaching or lecturing to a class not the blackboard. This can create a major problem if the teacher has to transfer large quantities of information to the board during which time his attention is inevitably withdrawn from the audience. Writing on the blackboard during a lecture should be done in small increments between which the attention of the lecturer is directed to the class. When referring to material already on the board, attention should be towards the class with occasional references to the board, not the other way round. Although this is a basic requirement of good teaching, it is often ignored by many experienced teachers. As a rule, this is equally applicable to other forms of visual aid such as projector slides and overhead transparencies.

The second pitfall for the blackboard user is that he must decide what the purpose in using the board is, then teach accordingly. If it is being used to impart large quantities of information which the audience is expected to record in detail, then sufficient time must be allowed for them to do this before discussing the next point. The lecturer should not take short cuts by rubbing out part of what is on the board in order to replace it by the next step in the argument. For example, if the sequence of events shown in Fig.2 is to be fully recorded by the student, it should be written out in full by the lecturer, who should not use one basic formula and remove and replace each side group as the lecture proceeds. If however, he is using this sequence merely to illustrate a point then the latter process would be legitimate.

Alternatively the lecturer may use the blackboard as a means of illustrating the lecture. Then the material illustrated should be kept to a minimum using similar guidelines to those for producing projector slides or overhead transparencies. The lecturer may wish to use the blackboard for one complex illustration which may be prepared before the class commences. In this case the whole of the audience must be able to see it clearly and, moreover, sufficient time must be allowed during the lecture for the audience to reproduce it if this is relevant. Finally, the lecturer may wish to use a blackboard as an informal aid during the discussion of a presentation. It is then important that such illustrations are clear to the whole of the audience not just the person with whom dialogue is being carried on at that time.

When using a blackboard the teacher must be able to use it legibly as no one else can prepare this material. This is clearly a disadvantage to some people, but the greatest disadvantage, affecting all users, is the creation of chalk dust. In modern lecture theatres and class rooms this disadvantage is eliminated by the installation of white blackboards and the use of felt pens. The disadvantage with these aids is that there are both water and spirit based pens, each of which should *only* be used with the appropriate boards and cleaner. In addition, it is extremely difficult to clean such boards completely after use.

## PROJECTOR SLIDES

Currently projector slides are usually 35mm positive transparent slides, although the principles of producing good slides of that dimension are equally true for other alternatives.

It was stated in the introduction that a good teacher never apologizes for the poor quality slides as this is never necessary if a few simple rules are followed. These may be divided into two groups, namely the preparation of the art work and its photography. A slide should not try to impart all the information, but merely ideas or concepts (e.g. Fig.1 is not a good subject for a projector slide). As a rough guide, a slide should contain no more than seven lines and no more than seven words per line. Sometimes this seems impossible, but may be achieved if the information is presented in a different way. For example, a clinical chemist may be describing the results of an evaluation of a multichannel analyser and may wish to tell the audience what analyses this instrument is capable of, as shown in Fig.3. This listing is quite inappropriate for one slide (and the audience will not remember the list anyhow). There are two alternatives; to present the list on successive slides according to the divisions shown in Fig.3, or to use group headings as shown in Fig.4. The latter is more appropriate as it does not detract from the information imparted.

The art work must be prepared in a clear uncluttered fashion and be laid out with the relative dimensions of the slide in mind. Diagrams and graphs should be as simple as possible and, for the latter, the grid lines should be omitted to improve the clarity. The so-called 35mm slide is in fact 20 x 35mm and thus the

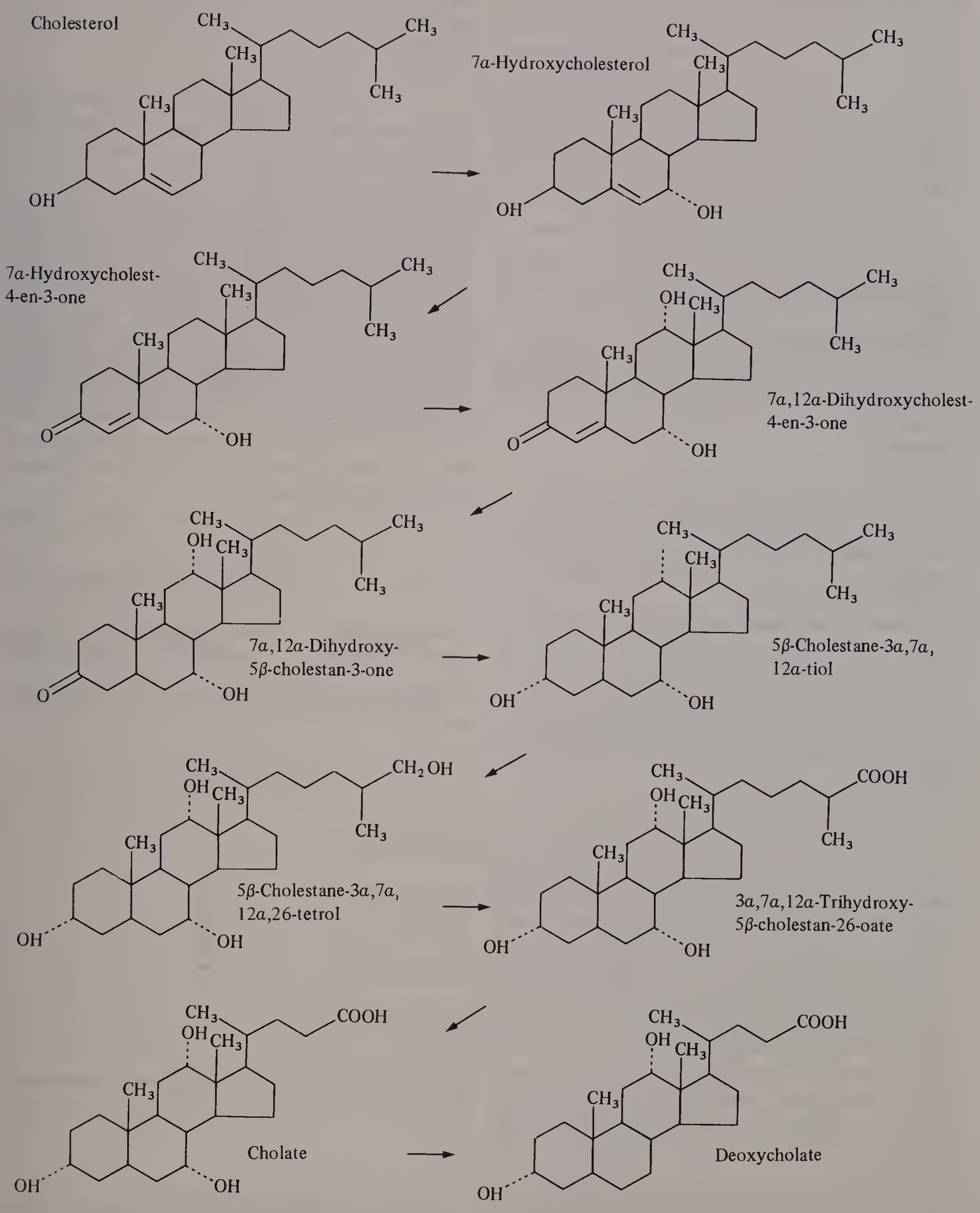

Cholesterol
7α-Hydroxycholesterol
7α-Hydroxycholest-4-en-3-one
7α,12α-Dihydroxycholest-4-en-3-one
7α,12α-Dihydroxy-5β-cholestan-3-one
5β-Cholestane-3α,7α,12α-tiol
5β-Cholestane-3α,7α,12α,26-tetrol
3α,7α,12α-Trihydroxy-5β-cholestan-26-oate
Cholate
Deoxycholate
CH3
OH
O
CH2 OH
COOH

Fig. 2. Formation of deoxycholate from cholesterol.

**Alanine transaminase**
**Albumin**
**Alkaline phosphatase**
**Aspartate transaminase**

**Calcium**
**Chloride**
**Cholesterol**
**Creatine kinase**
**Creatinine**

**Glucose**
**Hydroxybutyrate dehydrogenase**
**Iron**
**Lactate dehydrogenase**

**Phosphate**
**Potassium**
**Sodium**

**Total bilirubin**
**Total protein**
**Triglycerides**
**Unsaturated iron binding capacity**
**Urate**
**Urea**

**Fig. 3. List of analyses carried out by a multichannel analyser.**

**Electrolytes and renal function**
**Bone and liver analyses**
**Cardiac enzymes**
**Lipids**
**Iron and UIBC**
**Glucose**

**Fig. 4. Analytical groups carried out by a multichannel analyser.**

overall dimensions of the art work should be approximately in the ratio of 20 : 35, and should be commensurate with the size of letter and thickness of line to be used. A guide to suitable sizes and thicknesses is given in Fig.5. A good Illustration Department will produce good art work which the amateur lacking the same facilities will find difficult to match. However, there is an increasing range of stencil systems, transfers and large letter typewriters which now make this easier, so that the amateur can produce good quality work with practice and patience.

If the art work is black on white, then the best slide is produced by photography using the diazo process, usually producing a slide of white on blue. This is preferred to direct reproduction of black on white which often gives a poor definition. The use of colour in the artwork and its direct reproduction is sometimes useful but generally adds little in helping the slide make its point. The use of a camera to photograph the art work is undoubtedly the best method to produce good slides. In the absence of a camera, reducing photocopiers which will copy on to acetate sheets and infrared slide makers may be used to reduce and transfer typewritten material to 35mm slide size. However, in the author's experience these are unsatisfactory as the quality is usually poor. In the absence of an Illustration Department it is likely that there will be a Department on campus with photographic equipment and sufficient expertise to produce satisfactory slides from good artwork.

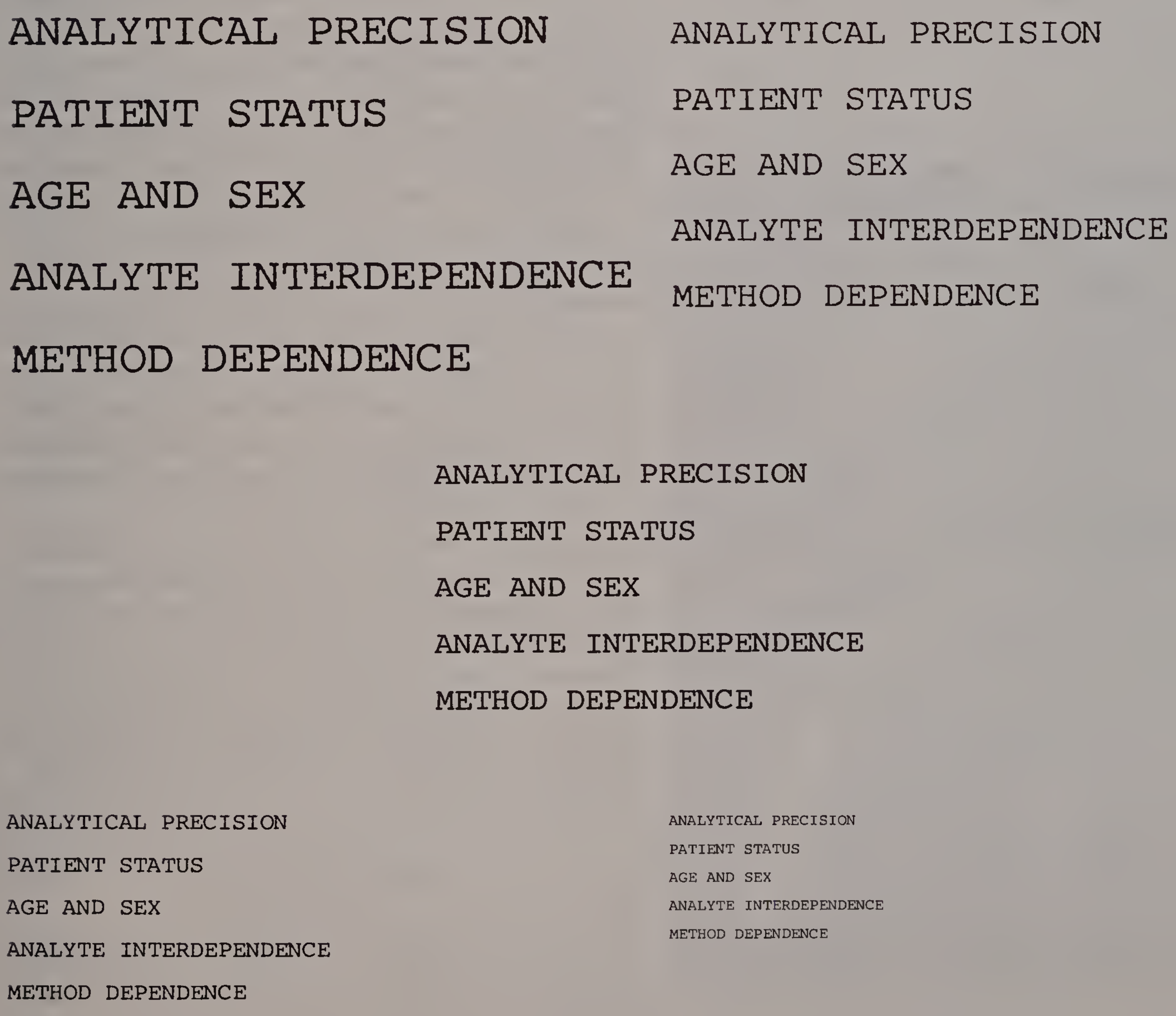
| Overall dimensions of art work (mm) | Upper case letter height (mm) | Minimum line thickness (mm) |
|---|---|---|
| 142 × 93 | 2 | 0.3 |
| 115 × 175 | 4 | 0.4 |
| 140 × 212 | 4 | 0.5 |
| 162 × 247 | 5 | 0.6 |
| 185 × 282 | 6 | 0.8 |

Fig. 5. A guide to letter size and minimum line thickness for art work.

The lecturer with good quality projector slides will not make the best use of these visual aids unless they are kept in a good clean state, and in the correct order. Having adhered to all these good practices, he or she may discover on arriving at the lecture theatre, that many of the audience are unable to see slides clearly. This may be due to inappropriate projection (which will probably be beyond his control) but it should be noted that the maximum viewing distance for a slide should not be greater than eight times its projected height. Finally, the speaker should remember that the audience may wish to take notes and consequently the lights should be dimmed not extinguished.

## OVERHEAD PROJECTOR

The overhead projector may be used in conjunction with a roll of transparent film in which case its use is akin to that of a blackboard. More commonly, however, it is used with overhead transparencies. In this case the recommendations for the type of information that should appear on such transparencies is the same as that given previously for projector slides. Because these are larger, and may be prepared more quickly and easily than projector slides, their preparation is not generally regarded as the job of an Illustration Department but rather that of the individual teacher. Consequently, they are often prepared freehand using felt pens and the resulting quality of presentation is poor. This need not be the case because, if the same rules for art work presentation are applied as for projector slides, the standard of the finished product will be equally high. Recent advances in copying equipment have meant that transparencies may easily be reproduced from typewritten originals. Fig.6 shows how a typewritten slide original may be reduced or magnified in size. Although reduction is not suitable for the production of 35mm slides the converse is not true; magnified images are very suitable for overhead transparency preparation. After magnification, black and white transparencies may be prepared directly with a copier since many modern copiers will reproduce on to acetate sheets as well as paper. Alternatively, infrared copiers will produce black and white or coloured transparencies


ANALYTICAL PRECISION
PATIENT STATUS
AGE AND SEX
ANALYTE INTERDEPENDENCE
METHOD DEPENDENCE

ANALYTICAL PRECISION
PATIENT STATUS
AGE AND SEX
ANALYTE INTERDEPENDENCE
METHOD DEPENDENCE

ANALYTICAL PRECISION
PATIENT STATUS
AGE AND SEX
ANALYTE INTERDEPENDENCE
METHOD DEPENDENCE

ANALYTICAL PRECISION
PATIENT STATUS
AGE AND SEX
ANALYTE INTERDEPENDENCE
METHOD DEPENDENCE

ANALYTICAL PRECISION
PATIENT STATUS
AGE AND SEX
ANALYTE INTERDEPENDENCE
METHOD DEPENDENCE

**Fig. 6. Magnification and reduction of type written art work. The original type script is shown in the centre.**

from black and white, typed and magnified originals.

The overhead projector may easily be used for preparing overlays. This is where parts of a diagram or table are produced on different transparencies which which, if carefully prepared, may be overlaid on each other to reveal the whole. This technique is used if the lecturer does not wish to reveal the whole of the content at one time. It tends to be over-used, but is useful on the few occasions when it is justified.

The overhead projector itself will be one of two basic designs, the difference being in the position of the lamp housing which may be in the base of the projector or, in the more recent design, in the head of the projecting arm. There is a considerable advantage in the latter because this does not require a cooling fan, and consequently is much quieter.

Insufficient care is often given to the placement of the overhead projector both in the lecture theatre and in the more informal environment of the seminar or class room. Frequently some of the audience cannot see part of the screen because it is obscured by the projecting arm. Also if the projector is not aligned properly with the screen, a distorted image is obtained.

Audiences have come to accept a poor quality of visual aid from the overhead projector compared to the slide projector because of lack of attention to details: this need not be the case.

There is another form of overhead projection which should be noted here, and that is the epidiascope. By using reflection, the epidiascope enables nontransparent material to be projected on to a screen. This has now largely been replaced by the type of overhead projector described above, as the quality of the projected image is much greater. Epidiascopes tended to be used for projecting material from books or documents — which are generally unsuitable as visual aids as they contain too much detail.

This trend is reflected in the fact that few lecture theatres now contain an epidiascope.

## THE POSTER

The poster, being the visual aid associated with a poster session presentation, is a relatively new aid form which is becoming increasingly popular. It is most commonly used for presentation of submitted research topics at congresses or symposia and, to some extent, has replaced the short, more formal, oral presentation. The advantage is that the audience may select those posters they wish to see and are able to discuss the presentation informally with the author, rather than have to sit through a full session of presentations in order to hear perhaps one 10 min talk.

The presenter is given board space usually with the approximate dimensions of 1 x 1.5m for a predetermined period of time, for example 2 h. These figures are typical but are obviously variable. It is important that the presenter is informed well in advance of the specification so that he may prepare material to fit the space available.

The rule for the preparation of the art work is similar to that for projector slides; ideas and concepts should be presented but not the details. The presenter should always be on hand by his poster for discussion, as the content will not be self-explanatory. A poster area of 1 x 1.5m should not contain more than eight sheets of A4 (approximately 30 x 20cm) size or the equivalent. Although the 7 line, 7 word rule for 35mm slides may be exceeded, it should not be by very much. If a large type typewriter is available, then this should be used in preference to the conventional type size. The information on each sheet should flow easily and clearly from one to the next. The viewer should not be left wondering in which order he should read the display. It is important that each poster has a clear heading with a title and the name(s) and address(es) of the author(s). This should be the rsponsibility of the organizers, but it is worth checking that they intend to supply such information if it is not obvious from the instructions provided.

Because poster displays are a relatively new form of visual aid, many contributors lack previous experience and the result is a tendency to try to impart too much information. They are using it as a blackboard, whereas it should be used as a succession of slides.

Finally, the teacher or lecturer must remember that, in using any form of visual aid, the assumption is made that the audience can read, and there is no need to read the slide to them. This is a common fault: think how many experienced TV commentators read the written word to their audience when it is presented to them on the screen.

## FILM AND TAPE MATERIAL

This group of visual aids includes videotapes, films and tape/slide programmes. It is an important and expanding area which should be mentioned here for completeness, but differs from the other aids in the cost and expertise involved in its preparation. Most material is prepared either commercially or in Departments in educational establishments set up specifically for this purpose. Clearly it cannot be prepared for a particular teacher's specific lecturing schedule, but rather a teacher would have to set his programme around the material available. Much of this is of commercial origin, but the number of educational Departments is increasing as is the availability of the material for hire or loan to individual teachers. A great deal produced from both sources is of considerable educational value.

In the past films have been preferred, with tape/slide programmes being used where a more static and less sophisticated presentation is appropriate. However, the use of videotapes has increased in recent years and will probably replace the film as more lecture and teaching areas have the necessary facilities. They have the additional advantage that there is good portable play back equipment and no conventional wall screen is required, which means that the material can be shown almost anywhere.

This paper was prepared in association with Dr. C. G. Fraser, Dr. C. J. Porter, Dr. M. K. Schwartz and Dr. O. Zinder, members of Commission VII.3.

# IUPAC PEOPLE

**Congratulations to:**

**Prof. R. G. Bates** (formerly Division V Committee) on receipt of the 1983 Anachem Award for his work on the thermodynamics of ionic equilibria in aqueous systems, saline media and mixed solvents, and standards for pH and ion-selective electrodes.

**Prof. L. Meites** (formerly Commission V.5) on the award of the Benedetti-Pichler Memorial Award of the American Microchemical Society.

**Dr. A. K. Covington** (Commission V.5) on becoming the third R. A. Robinson memorial lecturer of the Royal Society of Chemistry.

**Dr. H. J. Vos** (formerly Division VI Committee) on the award of the Chevreul Medal by the French Association for the Study of Fats.

**We regret to record the deaths of:**

**Dr. R. C. Chirnside,** UK (30 January 1983) — Vice-President of Analytical Chemistry Division Committee (1953–1957), Analytical Chemistry Division Committee (1949–1953).

**Prof. Sir Harold Thompson,** UK (31 December 1983) — President of IUPAC (1973–1975, Bureau (1963–1971), Publications Committee/ Editorial Board (1959–1965, 1969–1973), Physical Chemistry Division Committee (1955–1961), Commission on Molecular Structure and Spectroscopy (1957– ).

**Prof. Sir Morris Sugden,** UK (3 January 1984) — Committee on Teaching of Chemistry (1976–1982).

The late Prof. Sir Harold Thompson

# OTHER PEOPLE'S PUBLICATIONS

## ICSU Committee on Data for Science and Technology (CODATA)

**Data for Science and technology.** The above xvi + 350-page volume comprises the Proceedings of the 8th International CODATA Conference, Jachranka, Poland, 4–7 October 1982. The book aims at providing data-orientated scientists with the latest results and most significant developments in the generation, compilation, evaluation and dissemination of data in all disciplines of science and technology.

The 8th CODATA Conference put the emphasis on the role of data in the development and utilization of natural resources. The other major sections of the book include data developments in computerized handling, data banks, computer assisted design, data bank management, chemistry and the chemical industry, thermodynamics, materials science and metallurgy. It is unique in that it is a multidisciplinary, interdisciplinary and internationally compounded publication.

This publication is available from North-Holland Publishing Company, price US$49.00. ISBN 0-444-86668-X.

## ICSU Scientific Committee on Problems of the Environment (SCOPE)

**SCOPE Newsletter No. 20, December 1983.** The establishment of a subcommittee on metal cycling, its objectives and proposed activities. An international assessment of the environmental consequences of nuclear war has been started — members of the steering group named and intentions of SCOPE listed. The Mussel Watch II programme outlined — basically the measurement of persistent halogenated biocides and other pollutant chemicals in coastal waters utilizing bivalve molluscs (or other appropriate techniques), special attention being given to increasing available data on plutonium isotopes and americium. Lists of reports by SCOPE and SCOPE National Committees.

## International Federation of Clinical Chemistry (IFCC)

**IFCC News No. 35, 1983/3.** Article on the Core Clinical Laboratory and the first of a series of reports on the Workshop on 'A small laboratory'. Establishment of the IFCC Technical Secretariat. List of IFCC/WHO publications for laboratories with limited resources. Report of a meeting (June 1983) of the European Working Group on Ion-selective Electrodes. Meetings diary for 1984.

## International Organization for Standardization (ISO)

**ISO Bulletin, Vol. 14, No. 12, December 1983.** Contains a short article on the work of ISO/TC 158 — Analysis of gases, extracted from the monthly journal of the Netherlands member body of ISO. It stresses the importance of accurately prepared standard gas mixtures and of exact definition of the conditions under which analytical and measuring instruments should be used. The Working Group on natural gas (WGH) has recently had its terms of reference extended to include natural gas substitutes, in preparation for the day when the diminishing stock of natural gas requires the use of any such substitutes that have been developed.

A brief outline of the background to the photographic chemicals specification work of ISO/TC 42 is also to be found in this edition of the Bulletin.

## European Photochemistry Association (EPA)

**EPA Newsletter No. 19, November 1983.** Article on photochemistry in UK; note on the meaning of "photoanalysis". Conference reports on: 16th Bunsen Colloquium, March 1983; the French Group of Photochemistry, May 1983; 'Energy Transfer Processes in Condensed Matter', NATO Advanced Study Institute, June 1983; Gordon Research Conference on Organic Photochemistry, July 1983; 2nd Informal Brazilian Meeting on Photochemistry and Photobiology, August 1983; 11th International Conference on Photochemistry, August 1983; 19th Symposium on Theoretical Chemistry, October 1983. List of new books on photochemistry and related subjects. Paper on modern chemical actinometry. Composition and projects of IUPAC Commission III.3 and the provisional version of the Commission's *Glossary of terms used in photochemistry* for comment. Calendar of meetings 1984.

# INTERNATIONAL STANDARDS

There surely cannot be anyone in IUPAC who has not come across at least one International Standard issued by the International Organization for Standardization (ISO). Some Commissions are in close touch with the relevant ISO Technical Committees and Division Secretaries act as link men for IUPAC study of draft ISO Standards — as I well remember from my days as Secretary of Division V, although the system has changed since then. However, it was thought worthwhile periodically to publish in CI lists of recent ISO Standards that have some bearing on pure or applied chemistry. A start had to be made somewhere and the beginning of 1983 was chosen. Inclusions of irrelevancies and omissions of vitally important documents are the result of Editor's Discretion, an unstandardized and not too reliable quality.

In the list that follows, the prefix 'ISO' has been omitted from the Standard number and no attempt has been made to classify the titles or even to group them by issuing Technical Committees. At the moment the word processor in the Secretariat is fully occupied on other work. If you think that publication of such lists is a waste of time, effort and paper, please write to say so — we aim to please and positive reactions would also be welcome!

| | |
|---|---|
| 6387–1983 | Surface active agents — Determination of the power to disperse calcium soap — Acidimetric method (Modified Schönfeldt method) |
| 602–1983 | Coal — Determination of mineral matter |
| 5920–1983 | Chlorofluorinated hydrocarbons — Determination of water content — Gravimetric method |
| 1042–1983 | Laboratory glassware — One-mark volumetric flasks |
| 6842–1983 | Surface active agents — Polyethoxylated alcohol and alkylphenol sulfates — Determination of total active matter content |
| 6844–1983 | Surface active agents — Determination of mineral sulfate content — Titrimetric method |
| 6651–1983 | Animal feeding stuffs — Determination of aflatoxin $B_1$ content |
| 3681–1983 | Binders for paints and varnishes — Determination of saponification value — Titrimetric method |
| 3682–1983 | Binders for paints and varnishes — Determination of acid value — Titrimetric method |
| 78/4–1983 | Layouts for standards — Part 4: Standard for atomic absorption spectrometric analysis |
| 2144–1983 | Paper and board — Determination of ash |
| 6799–1983 | Animal and vegetable fats and oils — Determination of composition of the sterol fraction — Method by gas–liquid chromatography |
| 3136–1983 | Rubber latex — Styrene-butadiene — Determination of bound styrene content |
| 5317–1983 | Fertilizers — Determination of water-soluble potassium content — Preparation of the test solution |
| 6677–1983 | Hexafluorosilicic acid for industrial use — Determination of available fluorine content — Potentiometric method after distillation |
| 4597/1–1983 | Plastics — Hardeners and accelerators for epoxide resins — Part 1: Designation |
| 7407–1983 | Fertilizers — Determination of acid-soluble potassium content — Preparation of the test solution |
| 6142–1981/ Add. 1–1983 | Gas analysis — Preparation of calibration gas mixtures — Weighting methods |
| 1770–1981/ Amd. 1–1983 | Solid-stem general purpose thermometers. Amendment 1 |
| 1771–1981/ Amd. 1–1983 | Enclosed-scale general purpose thermometers. Amendment 1 |
| 5975–1983 | Chromium ores — Determination of calcium and magnesium contents — EDTA titrimetric method |
| 6233–1983 | Manganese ores and concentrates — Determination of calcium and magnesium contents — EDTA titrimetric method |

| | |
|---|---|
| 5381–1983 | Starch hydrolysis products — Determination of water content — Modified Karl Fischer method |
| 5666/1–1983 | Water quality — Determination of total mercury by flameless atomic absorption spectrometry — Part 1: Method after digestion with permanganate-peroxydisulfate |
| 5666/2–1983 | Water quality — Determination of total mercury by flameless atomic absorption spectrometry — Part 2: Method after pretreatment with ultraviolet radiation |
| 6977–1983 | Natural gas — Determination of water and methanol contents — Gas chromatographic method |
| 5504–1983 | Oilseeds and oilseed residues — Determination of isothiocyanates and vinyl thiooxazolidone |
| 5986–1983 | Animal feeding stuffs — Determination of diethyl ether extract |
| 6496–1983 | Animal feeding stuffs — Determination of moisture content |
| 6209–1983 | Rubber compounding ingredients — Carbon black — Determination of solvent extractable material |
| 4577–1983 | Plastics — Polypropylene and propylene copolymers — Determination of thermal oxidative stability in air — Oven method |
| 457-1983 | Soaps — Determination of chloride content — Titrimetric method |
| 5379–1983 | Starches and derived products — Determination of sulfur dioxide content — Acidimetric method and nephelometric method |
| 6855–1983 | Road vehicles — Measurement methods for gaseous pollutants emitted by mopeds equipped with a controlled ignition engine |
| 6614–1983 | Petroleum oils and synthetic fluids — Determination of demulsibility characteristics |
| 6615–1983 | Petroleum products — Determination of carbon residue — Conradson method |
| 5990–1983 | Photographic grade potassium sulfite, 650 g/l aqueous solution — Specification |
| 753/3–1983 | Acetic acid for industrial use — Methods of test — Part 3: Determination of formic acid content — Iodometric method |
| 1897/11–1983 | Phenol, *o*-cresol, *m*-cresol, *p*-cresol, cresylic acid and xylenols for industrial use — Methods of test — Part 11: Determination of crystallizing point (Excluding cresylic acid and xylenols) |
| 1897/12–1983 | Phenol, *o*-cresol, *m*-cresol, *p*-cresol, cresylic acid and xylenols for industrial use — Methods of test — Part 12: Determination of distillation characteristics (Cresylic acid and xylenols only) |
| 7058–1983 | Phosphoric acid for industrial use — Determination of higher soluble sulfate contents — Titrimetric method after reduction |
| 7099–1983 | Phosphoric acid for industrial use (including foodstuffs) — Determination of hydrogen sulfide content — Titrimetric method |
| 7660–1983 | Essential oils — Determination of ester value of oils containing difficult-to-saponify esters |
| 6331–1983 | Chromium ores and concentrates — Determination of chromium content — Titrimetric method |
| 7625–1983 | Sintered metal materials, excluding hardmetals — Preparation of samples for chemical analysis for determination of carbon content |
| 7627/1–1983 | Hardmetals — Chemical analysis by flame atomic absorption spectrometry — Part 1: General requirements |
| 7627/2–1983 | Hardmetals — Chemical analysis by flame atomic absorption spectrometry — Part 2: Determination of calcium, potassium, magnesium and sodium in contents from 0.001 to 0.02% (*m/m*) |
| 7627/3–1983 | Hardmetals — Chemical analysis by flame atomic absorption spectrometry — Part 3: Determination of cobalt, iron, manganese and nickel in contents from 0.01 to 0.5% (*m/m*) |
| 7627/4–1983 | Hardmetals — Chemical analysis by flame atomic absorption spectrometry — Part 4: Determination of molybdenum, titanium and vanadium in contents from 0.01 to 0.5% (*m/m*) |
| 7627/5–1983 | Hardmetals — Chemical analysis by flame atomic absorption spectrometry — Part 5: Determination of cobalt, iron, manganese, molybdenum, nickel, titanium and vanadium in contents from 0.5 to 2% (*m/m*) |
| 6570/1–1983 | Natural Gas — Determination of potential hydrocarbon liquid content — Part 1: Principles and general requirements |
| 4052–1983 | Coffee — Determination of caffeine content (Reference method) |

| | |
|---|---|
| 3856/1–1983 | Paints and varnishes — Determination of "soluble" metal content — Part 1: Determination of lead content — Flame atomic absorption spectroscopic method and dithizone spectrometric method |
| 2303-1983 | Rubber, polyisoprene (IR) — Non oil-extended, solution-polymerized types — Test recipe and evaluation of vulcanization chracteristics |
| 7100–1983 | Phosphoric acid for industrial use (including foodstuffs) — Determination of vanadium content — Phosphotungsten vanadate spectrometric method |
| 6466–1983 | Tobacco and tobacco products — Determination of dithiocarbamate pesticides residues — Molecular absorption spectrometric method |
| 331-1983 | Coal — Determination of moisture in the analysis sample — Direct gravimetric method |
| 333-1983 | Coal — Determination of nitrogen — Semimicro Kjeldahl method |
| 6293–1983 | Petroleum products — Determination of saponification number |
| 3690–1977/ Add. 2 | Welding — Determination of hydrogen in deposited weld metal arising from the use of covered electrodes for welding mild and low alloy steels |
| 78/3–1983 | Chemistry — Layouts for standards — Part 3: Standard for molecular absorption spectrometry |
| 5889–1983 | Manganese ores and concentrates — Determination of aluminium, copper, lead and zinc contents — Flame atomic absorption spectrometric method |
| 7387/1–1983 | Adhesives with solvents for assembly of uPVC pipe elements — Characterization — Part 1: Basic test methods |
| 6879–1983 | Air quality — Performance characteristics and related concepts for air quality measuring methods |
| 5813–1983 | Water quality — Determination of dissolved oxygen — Iodometric method |
| 5815–1983 | Water quality — Determination of biochemical oxygen demand after *n* days ($BOD_n$) — Dilution and seeding method |

---

## IUPAC PUBLICATIONS

### Chemical toxicology and clinical chemistry of metals

These Proceedings, edited by S. S. Brown and J. Savory, contain the texts of 13 plenary lectures and 50 selected communications which were presented to the 2nd International Conference on the Chemical Toxicology and Clinical Chemistry of Metals, Montreal, 19–22 July 1983, organized by the Commission on Toxicology of IUPAC Clinical Chemistry Division.

As with the first conference, which was held in Monte Carlo in 1977, the published material reflects the concern of the Commission to bring together physicians and scientists from different disciplines to present a broad, balanced, and up-to-date perspective of metal toxicology. The scope of the papers is indicated by the four sections into which the Proceedings are organized — Analysis and quality assurance; Occupational and environmental exposures; Speciation and interactions; Clinical and experimental studies.

The volume indeed reflects the state-of-the-art of metal toxicology and shows that it is a dynamic subject which is of worldwide interest and importance. It is available from Academic Press, price US$35. ISBN 0-12-137520-X.

## RECENT REPORTS

### Nomenclature, symbols and units recommended for *in situ* microanalysis (*Provisional*)

In view of the rapid developement of physical techniques for analysis of solid state materials, recommendations concerning *in situ* microanalytical techniques are proposed. These recommendations concern nomenclature, acronyms, symbols and units and should serve as a contribution to the elimination of widely different technique names.

The proposals concern the following techniques: Electron Probe Microanalysis, Electron Probe X-Ray Microanalysis, Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Transmission Electron Microscopy, Transmission High Energy Electron Diffraction, Reflection High Energy Electron Diffraction, Low Energy Electron Diffraction, *In-situ*-Micro-X-Ray Diffraction, Transmission and Reflection Electron Energy Loss Spectroscopy, Auger Electron Spectroscopy, Ion Probe Microanalysis, Ion Microscopy, Laser Raman Microanalysis, Particle Induced X-Ray Emission Spectroscopy, Laser Micro Mass Spectrometry, Laser Micro Emmision Spectroscopy. Related terms are also dealt with.

This Commission V.2 report was published in PAC, Vol. 55, pp. 2023-2027 (1983). Comments should be sent within eight months of publication to Dr. A. Townshend, Department of Chemistry, University of Hull, Hull, HU6 7RX, UK.

## Nomenclature, symbols, units and their usage in spectrochemical analysis — Part VI: Molecular luminescence spectroscopy (*Recommendations 1983*)

Part VI is a sequel to previous documents in the series *Nomenclature, symbols, units and their usage in spectrochemical analysis* issued by the Analytical Chemistry Division of IUPAC. It does not aim to be completely self-contained since many of the terms and units needed for describing molecular luminescence spectroscopy have already appeared in parts I, II and III. However, to facilitate reference, all terms important to molecular luminescence, together with their symbols and units — and these include many appearing in previous documents — are presented in the Tables. There is also an alphabetic index of terms.

In the past, the terms quantum yield and quantum efficiency have usually been considered interchangeable. It is now recommended that these terms should be used strictly as defined in Part VI. The use of photon quantities is presented for the first time. Photon quantities are important in molecular luminescence spectroscopy and although they have been in use for some years, no international organization has come forward with recommendations for symbols for these quantities. Where the measurement is primarily interested in the number of photons flowing in a beam of radiation, it is recommended that a subscript ‘p’ be used on the corresponding energy or flux quantity.

This nomenclature report by Commission V.4 was published in PAC, Vol. 56, pp. 231–245 (1984).

## Critical survey of the formation constants of complexes of histidine, phenylaniline, tyrosine, L-DOPA and tryptophan

This survey is part of *Critical evaluation of formation constants in solution,* a series prepared with the support of the Analytical Chemistry Division of IUPAC to provide guidance to users of formation constants who may not have the necessary background to evaluate the diversity of values reported in the literature. The amino acids chosen all contain sidechains which are aromatic in character, and all are important biologically. Histidine is significantly different in that its sidechain can coordinate strongly to metal ions through the pyridine-like nitrogen atom of the imidazole ring. This is one of the major points of interaction between proteins and transition metal ions.

The survey considers all reported measurements of both proton and metal complex formation constants up to 1981. In addition reported values for enthalpy changes on complex formation (determined potentiometrically or calorimetrically) are reported and assessed. ‘Tentative’ or ‘Recommended’ values for both proton and metal complex formation constants are tabulated where the quality and quantity of reported values allow.

This report by Commission V.6 was published in PAC, Vol. 56, pp. 247–292 (1984).

## Radiochemical problems of fusion reactors: Part I. Facilities

The research carried out in several countries in order to make controlled nuclear fusion a feasible energy alternative includes extensive studies of candidate materials for fusion reactors. Although this work involves chemistry in many different ways, the participation of chemists in fusion material research has so far been limited. The present report provides a brief review of the present situation in this area, with emphasis on the availability of proper irradiation facilities, and presents recommendations for further work which can be summarized as follows:

A. Research chemists and radiochemists in institutions where fusion research is done should cooperate in this work and contribute to the identification and solution of fusion materials problems, in particular with respect to the interaction of the plasma and plasma radiation with the first wall and the blanket.

B. Chemical experimentation possibilities for these interaction studies should be included in the design of future facilities for plasma physics research, and studies should be made to incorporate similar possibilities into existing installations.

C. Relatively large high-energy neutron sources for the irradiation testing of fusion materials should become available as soon as possible, preferably as internationally financed projects.

This report by Commission V.7 was published in PAC, Vol. 56, pp. 293–299 (1984).

## Recommendations on reporting electrode potentials in nonaqueous solvents *(Recommendations 1983)*

This report recommends that the redox couples ferrocene/ferricenium ion [ferrocene: bis(η-cyclopentadienyl)iron(II)] and bis(biphenyl)chromium(I)/bis(biphenyl)chromium(0) be employed as reference redox systems. Procedures for measuring and reporting electrode potentials in nonaqueous solvents vs these reference redox systems are presented. The difference in electrode potentials for ferrocene/ferricenium ion and bis(biphenyl)chromium(0)/bis(biphenyl)chromium(I) ion for 22 solvents obtained by polarography and cyclic voltammetry are listed. Both of the recommended redox systems approach a solvent independent redox system as closely as presently known. Electrode potential data reported vs these systems permit the comparison of electrode potentials for a given system in different nonaqueous solvents and thus allow studies of solvent effects on electrode potentials in nonaqueous systems by compiling and comparing data obtained in different solvents.

This report by Commission I.3 has been published in PAC, Vol. 56, pp. 461–466 (1984).

## Formation of metal complexes with ethylenediamine: A critical survey of equilibrium constants, enthalpy and entropy values

At present ethylenediamine is one of the more studied nitrogen-ligands. The main physico-chemical properties of this diamine are reported in this survey. The fundamental techniques for its purification and storage and its acid-base characteristics in aqueous solution are described. The formation constants of complexes with various metal ions, the thermodynamic values relative to the reactions of formation of the complexes and their stereochemistry are presented. The protonation constants of the diamine and the corresponding enthalpic and entropic values obtained in various ionic media have been considered and a critical examination of the results is presented. The values of the stability constants of the complexes and the thermodynamic quantities relative to the equilibria present have been critically examined. Such values are recommended when the metallic systems, also in their proton- and hydroxide-form, are well determined and results by different authors are in agreement. For cases lacking accurate data tentative values are suggested or further investigations are recommended. Errors on the recommended values have been estimated.

This report by Commission V.6 has been published in PAC Vol. 56, pp. 491–522 (1984).

## Selected data on ion exchange separations in radioanalytical chemistry

Ion exchange separation methods have found wide applications in analytical chemistry. Its most remarkable success was in the separation and identification of rare earth fission products and several artificial transuranium elements.

In this report, some data on ion exchange which are of great interest to radiochemists are selected from analytical and radioanalytical journals. The report presents ten charts of cation- and anion-exchange distribution coefficients in a variety of acid solutions and nineteen diagrams of ion exchange chromatographic separations of radiochemical importance. In selecting the data, emphasis was placed on the literature published during the last two decades. However, some earlier work which is pertinent to recent progress was also included.

This report, prepared by Commission V.7 has been published in PAC, Vol. 56, pp. 523–539 (1984).

## General aspects of trace analytical methods — VI. Acid pressure decomposition in trace element analysis

Wet decomposition procedures within sealed systems (pressure decomposition) provide efficient methods for sample dissolution in trace element analysis. Vessels produced from high-purity materials (PTFE, glassy carbon), contained by compact pressure casings (stainless steel, aluminium alloys) are used in this technique. At temperatures of about 170°C the reaction capacity of acids and oxidizing decomposition agents increases so that inorganic and organic samples of a most widely differing composition are dissolved in a relatively short time.

Despite the undeniable advantages which pressure decomposition methods offer, there are some problems arising from material properties and the construction details of pressure vessels and casings. In many cases, small residues of incompletely decomposed organic samples cause interferences in the subsequent determination of trace elements when electrochemical or spectrochemical methods with a high power of detection are used.

In this report, an attempt is made to compile the specific advantages of, and the problems posed by, pressure decomposition procedures, such as increased reactivity, faster reaction, decrease in blank values, avoidance of trace element losses, easy control of precision and calibration, completeness of sample decomposition, possible formation of explosive products, etc. At the same time, the properties of materials used for vessels and casings, the critical constructional features and their effects on operational efficiency and working safety, regarding vessel, casing and heating systems, are discussed.

This report from Commission V.2 has been published in PAC, Vol. 56, pp. 479–489 (1984).

## Spectrophotometric and fluorimetric determination of amines

Thirteen procedures are described in this report for the colorimetric and fluorimetric determination of amines. In the presence of an appropriate base, 1,3,5-trinitrobenzene condenses with nitromethane to give a red Meisenheimer-type complex which allows determination of alkylamines and quaternary ammoniums. The mobility of the hydrogen atom (or atoms) bonded to the amino nitrogen atom of primary and secondary alkyl- and arylamines, allows derivatives which permit general or selective determinations. Primary and secondary alkyl- and arylamines are so estimated through the formation of N-substituted derivatives of *p*-nitrophenylazobenzamide or of 2,4-dinitroaniline (according to another procedure, only primary alkylamines afford the latter derivatives). Primary alkyl- and arylamines react with succinic dialdehyde to give a pyrrole derivative which is then developed with *p*-dimethylaminobenzaldehyde and they also yield fluorescent derivatives with fluorescamine. Primary and secondary alkylamines produce fluorescent 4-amino derivatives with 7-nitrobenzofurazan. Secondary alkylamines are selectively determined as N-substituted derivatives of 2-chloro-3-(2-aminoethenyl)-5,6-dicyano-1,4-benzoquinone, or of 4-amino- or 4,5-diamino-1,2-benzoquinone. Only primary arylamines condense with glutaconic dialdehyde to yield a coloured Schiff's base. Diazo coupling with *p*-nitrophenyldiazonium ion allows the estimation of all classes of arylamines. Tertiary alkylamines and quaternary ammoniums develop a colour with *cis*-aconitic anhydride in the presense of acetic anhydride, whereas only tertiary alkylamines develop a fluorescence with a mixture of aconitic acid and acetic anhydride.

This report, prepared by Commission V.1, has been published in PAC, Vol. 56, pp. 467–477 (1984).

## Collection, processing and storage of specimens for biological monitoring of occupational exposure to toxic chemicals

Exposure to at least 100 different chemicals may be estimated on an individual basis from their concentrations in blood or urine. The present document reviews sources of error in the collection, processing and storage of specimens for this biological monitoring.

Physiological factors cause variation in the concentration of chemicals in the body fluids. Distribution of water depends on posture. Exercise and meals cause changes in blood constituents. The urine output varies, and thus the concentrations of dissolved chemicals change. Many toxic chemicals show short half times in the blood; thus their concentrations depend on the timing of the specimen collection. Skin absorption may result in dramatically different chemical concentrations in different parts of the circulation.

The stability of chemicals in the collected specimens is generally limited: chemical deterioration, absorption, precipitation, and evaporation are the main causes of losses. For many chemicals, especially for trace elements, contamination of the specimen is the overwhelmingly most important source of error.

As the range of the chemicals measured is wide, the relative importance of the sources of error is different for different chemicals. Information on most chemicals is at present very limited; thus before commencing a programme on biological exposure monitoring it is advisable first to find the optimal conditions for specimen collection, processing and storage.

This report by Commission VII.4 has been published in PAC, Vol. 56, pp. 549–566 (1984).

## Evaluation of the solubility of electrolytes from conductivity measurements

The existence of reliable theoretical expressions for the concentration dependence of electrolytic conductivity facilitates the calculation of solubility from the value of molar conductivity of the saturated solution. A procedure is recommended and the expressions for the concentration dependence of the molar conductivity are given. They may be used for all strong electrolytes and for weak symmetric electrolytes. It may be advantageous for solubility determinations to measure the conductivity of the saturated solution as well as those of the solutions prepared by diluting it.

This Commission V.8 report has been published in PAC, Vol. 56, pp. 541–547 (1984).

# Names and addresses

We have been advised of the following changes necessary in the lists given in CI, 1983, No. 5:

*Chairman* — FINANCE COMMITTEE

Dr. H. F. WILSON,
3 Joining Brook,
Spring House, Pennsylvania 19477, USA.
**(Tel: +1 (215) 628 8399. Telex: 845247 c/o Mrs. DORIS WHELAN)**

*President* — DIVISION VII

Prof. F. W. SUNDERMAN, Jr.,
Departments of Laboratory Medicine and Pharmacology,
University of Connecticut Medical School,
263 Farmington Avenue, Farmington,
Connecticut 06032, USA.
**(Tel: +1 (203) 674 2328)**

*Chairman* — I.6

Prof. K. S. W. SING,
Department of Chemistry,
Brunel University,
Uxbridge, Middlesex UB8 3PH, UK.
**(Tel: +44 (895) 37188. Telex: 261173)**

*Secretary* — III.3

Prof. SILVIA E. BRASLAVSKY,
Max-Planck-Institut für Strahlenchemie,
Stiftstrasse 34-36,
D-4330 Mülheim/Ruhr 1,
Federal Republic of Germany.
**(Tel: +49 (208) 31073. Telex: 856741 MPSTR)**

*Secretary* — VI.3

Mr. W. D. POCKLINGTON,
Laboratory of the Government Chemist,
Cornwall House,
Stamford Street,
London SE1 9NQ, UK.
**(Tel: +44 (1) 928 7900. Telex: 881314 DIHQG LAB GOV CHEM)**

# CHEMISTRY, EDUCATION AND SOCIETY

## A View of the 7th International Conference on Education in Chemistry

by L. Paoloni, Committee on Teaching of Chemistry

### THE MAIN PATTERN

The Conference, jointly sponsored by IUPAC and the French Comité National de la Chimie (CNC), and organized in collaboration with UNESCO, was held in Montpellier (France) from 21 to 26 August 1983. 'Chemistry, Education and Society' was its general theme, and all the activities were carried out on the campus of the Université des Sciences et des Techniques du Languedoc (USTL). There were over 700 participants, 180 from France and the others from about 60 countries representing all the continents.

The conference, organized in plenary lectures, workshops, seminars and poster presentations, was essentially bi-lingual: English and French. Simultaneous translations were available for the lectures and the announcements, whereas at the workshops, *rapporteurs* helped with translation.

The plenary lectures covered a variety of topics. They are listed here in the order they were given:

*What sort of chemistry will we teach tomorrow and to what sort of society?* J. Bénard (CNC, Paris, France).

*A crossroad in human history: a challenge for the University.* P. Crabbé (IOCD, UNESCO, Paris, France).

*Developing new perspectives in chemical education. How can research contribute?* R. Kempa (University of Keele, UK).

*Chemistry and education: what kind of research? Perspectives and Realities.* R. Viovy (Ecole Normale Superièure de St. Cloud, France).

*Safeguarding energy and raw materials. A challenge for mankind.* K. Weissermel (Frankfurt, FRG).

*Chemistry, a disliked subject in French secondary teaching.* F.Tambute (Secondary school, Paris, France).

*Putting chemistry in its place: the social relevance of chemical education.* J. Holman (Watford Grammar School, UK).

*Chemistry and uncertainty.* I. Prigogine (University of Bruxelles, Belgium).

Some questions from the audience were asked soon after the lectures, and with two exceptions, the speakers made themselves available at an optional session, entitled ''Conversation with . . .'', open in the afternoon.

### SOME OTHER FEATURES

Among the main features of the Conference were the workshops. Participants were distributed, according to their choice and in groups of 20, to discuss and act on a particular subject. Topics and objectives had been planned ahead by two leaders and some cooperating specialists, contacted and chosen by the Organizing Committee of the Conference. There had been, therefore, preparatory work, carried out by correspondence and telephone conversations, which involved about a hundred persons for over a year. The workshops at the Conference were held in two successive series (each 5 h, in 2 days) so as to allow each participant to attend at least two of them. A list of themes and objectives is given in the Appendix. It seems relevant that any chemist should have a look at them because these themes were chosen out of a preliminary list distributed with the application form, and therefore represent the pattern of themes, motivations and objectives which are considered important by those who are active in chemical education today.

The most largely attended workshop was that on Computer-assisted Learning. One hundred participants were subdivided into four groups at each series, with a staff of nine. There were opportunities to do practical, hands-on, work on the microcomputer facilities made available by chemists from Nice and the local University.

Another interesting feature of the organization was that the poster papers were grouped as far as possible according to each workshop theme, and displayed close to the corresponding workshop rooms. Facilities were available for demonstrations of laboratory work in 16 stands, and for showing audiovisuals in over 20 places. An interesting occasion was offered to a (limited) number of participants to organize seminars on topics of their own choice.

There were several remarkable social events with excellent food and wines. Our colleagues Danièle Cros and Maurice Chastrette, the local organizers, deserve special appreciation and thanks for coping with the unpredictable heavy rain which threatened to spoil the open-air banquet in the Montpellier countryside.

## A PERSONAL EVALUATION

I have not attemped to give here a summary of the plenary lectures because their titles are enough to stimulate future reading of their texts in the Proceedings. Instead I have stressed the organizational aspects because they seem to me to have a more general value for the readers of CI. My feeling is that the Organizing Committee was successful in involving all participants in the activities. This was of significant (educational) value to me and I hope to many of us.

The Conference was also an occasion to get first hand acquaintance with the problems of French chemical education. The plenary lectures given by J.Bénard, R. Viovy, and F. Tabute, as well as the communications and discussions with other French chemists showed that there was a genuine desire that students, at all levels, are made aware of what chemists do in society, but there are different views of what should and can be done. There are several initiatives which indicate a general desire for more autonomy from the traditional centralizing influence of Paris.

The most interesting perspective towards coping with these problems were provided in the lectures by R. Kempa and J. Holman. Kempa stressed that a significant improvement of the relevance of chemistry in education requires the development of curricula which have objectives other than the conceptual structure of chemistry alone, as it has been so far. Dimensions related to cultural and social interests of everybody have to be introduced. Holman gave detailed information on the Science in Society Project, its present achievements and what is being done along the lines indicated by Kempa. While listening to their talks I had feelings of regret for the difficulties which are met by those who try to work with a similar approach in Italy.

## APPENDIX

### *Workshop 1 : Audio-visual Aids for Teaching*

A critical study on the actual use of audio-visual.
An assessment of the impact of documents.
Development prospects.

### *Workshop 2 : Computer-assisted Learning*

*To help* teachers to become *aware* of the many and varied possibilities in the use of computers in teaching of chemistry.
*To improve,* from the point of view of information and training, the techniques of those teachers already involved in computer-assisted learning:

the new roles of the teacher in computer assisted-learning,

the assessment of teaching methods, systems and techniques and their circulation,

the future of computer-assisted learning under the new light of possible techniques with micro-computers.

### *Workshop 3 : Teaching of Experimental Chemistry at Tertiary Level*

*To analyse* laboratory teaching of chemistry in terms of: goals, pedagogical options, teaching organization, criteria for the assessment of the students and the teaching.

### *Workshop 4 : Teaching of Experimental Chemistry at Secondary Level*

*To analyse* and to assess the different approaches to the experimental teaching of chemistry, working from experiences and documents offered by the participants (posters, audiovisual documents, computer-assisted learning . . . etc).

### *Workshop 5 : Low-cost Equipment at Tertiary Level*

*To test* the low-cost equipment offered and to *Compare* with normal and corresponding equipment.
*To familiarize* the participants with the techniques for producing low-cost equipment so as to incite them to build it themselves.

### *Workshop 6 : Low-cost Equipment at Secondary Level*

*To exchange* experiences :

In the use of local resources of daily life,

in the development of inexpensive equipment for the teaching of chemistry.

*To use* and *to assess* the equipment which may be presented.

### *Workshop 7 : Safety*

*To examine* how to diffuse information about safety problems.
*To investigate* the methods for teachers' and students' training
*To define* prevention means against chemical risk in experimental laboratories in every day life, . . .

### *Workshop 8 : Chemistry and Energy*

*To sift off,* working from examples, the originality and essential characteristics of chemical energy: origin, storage, and transformation into other forms of energy in relation to the chemistry syllabus as a whole.
Working from the example of an industrial plant, *to assess* the amounts of lost energy and the causes for the loss.
*To integrate* the problems of energy in chemistry teaching.

*Workshop 9 : Chemistry and National Resources*

*To define* the natural resources and give a classification.
*To study* how are valorized the ground natural resources in a natural space.
*To sift off* teaching units for secondary and tertiary level.

*Workshop 10 : Chemistry and Environment*

*To explore* the chemistry of the environment as an area of instruction for secondary and tertiary level chemistry teaching.
*To identify* experiments and demonstrations which can be done in the class-room and *to develop* them in sufficient detail for successful teacher use.
*To view* audio-visual software (TV, slides, films, computer programs) of value in environmental chemistry.
If practical *to outline* teaching units for secondary or tertiary level.

*Workshop 11 : Chemistry, Agriculture, Food*

*To list :*
Protein needs and their dispersion,
the different sources of proteins on a world scale and the assessment of some of these.
*To study* the quality of foods and the effects of technological treatments on their nutritional value (and their toxicity).
*To assess* the principal chemical methods for analyzing food products.

*Workshop 12 : Chemistry and Health*

*To study* the principals of research into a new medicine.
*To define* the aims and means of teaching chemistry with regard to training in the field of health.
*To determine* the impact of chemistry on health problems with reference to specific examples.
*To examine* the role of the large international health organizations.

*Workshop 13 : Chemistry and Industry*

*To assess* the aims and means for training chemists employed by industry (level of training, knowledge, attitudes . . .) with reference to specific examples and studies in the industrial field.

*Workshop 14 : Secondary Teachers' Training*

*To define* teacher training by :
its goals,
its aims and objectives,
its methods, contents, structure.
*To exploit* the results of educational research for initial of continuous training.

*Workshop 15 : Tertiary Teachers' Training*

*To consider.* the historical and social dimensions of chemistry.
*To consider* and take into account the psychological dimensions of the teaching profession.
*To point out* the dialectic between experiences and theory.
*To exploit* the results of educational research.

*Workshop 16 : Curriculum Design*

*To adapt* the curriculum and the teaching models according to the capabilities, motivation and mental structures of the students.
*To define* the different programs in chemistry for the different requirements.
*To determine* who is to be responsible for choosing the programs.
*To take* into account the interactions between chemistry and the other teaching fields.

*Workshop 17 : Assessment*

*To prepare* a booklet in which will be outlined the main rules for drafting different types of questions with illustrations relative to the field of chemistry
*To examine* the different types of Evaluations (of programs, teachers, . . .), other than the evaluation of the students by the teacher.

*Workshop 18 : Research into Chemistry Education*

*To examine* with a critical eye the results of *Educational Research* and their implications :
Initial training and continuous education,
Basic and applied research,
The training of chemists employed in industry,
The improvement of the chemistry image in society.

*Workshop 19 : Chemistry and the General Public*

*To define* the ways and means the participants consider to be the most suitable for giving to the general public an image of chemistry which is as close to reality as possible. With this aim in view, the chemists should *collaborate* with those in charge of organizations intended for the public (the press, radio, television, cinema, youth clubs, science and/or technology museums . . .).

*Workshop 20 : Publications*

*To research* the ways and means to improve the efficiency of publications in the Educational Research field
*To analyse* why some anterior periodics are failed.

---

## ICSU AB Conference on Electronic Document Delivery and Electronic Publishing

ICSU AB and the Commission of the European Communities are jointly organizing a conference on 13–14 June 1984 in Luxembourg to present and discuss ten projects which are being co-financed by the Commission as part of its programme of support for the development of Electronic Delivery and Electronic Publishing in Europe.

The conference will provide the first opportunity for publishers, librarians, service providers, information specialists and technologists to discuss the projects in detail, and to suggest further activities which can contribute to the growth and exploitation of IT-based services in Europe, and to hear of the Commission's plans for future developments. The conference fee is 1250 French francs. Interpretation from and into English, French, German and Italian will be provided.

Further details and registration forms are available from Mlle. Marthe Orfus, Executive Secretary, ICSU AB, 51 Boulevard de Montmorency, 75016 Paris, France.

# IUPAC CONFERENCES

Additional information from address in parentheses

## 1984

### LOW-DIMENSIONAL SYNTHETIC METALS

June 17–22. International Conference on the Physics and Chemistry of Low-dimensional Synthetic Metals. Abano Terme, Italy.
(Prof. G. Zerbi, Dipartimento di Chimica Industriale e Ingegneria Chimica, Politecnico di Milano, Piazza Leonardo da Vinci 32, I-20133 Milano, Italy.)

### SOURCES OF ORGANIC MATERIALS

June 25–29. Resource Material Conversion to meet Future Needs — (Bio-) Chemical Process Bridges, CHEMRAWN III. The Hague, The Netherlands.
(Congress Bureau, QLT Convention Services, Keizersgracht 792, 1017 EC Amsterdam, The Netherlands.)

### CARBOHYDRATES

July 1–7. 12th International Carbohydrates Symposium. Utrecht, Netherlands.
(Prof. J. F. G. Vliegenthart, c/o Secretariat XIIth International Carbohydrate Symposium, Department of Bio-Organic Chemistry, State University of Utrecht, P.O. Box 5055, NL-3502 JB Utrecht, Netherlands.)

### MODIFIED POLYMERS

July 2--5. 6th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia.
(Dr. A. Romanov, Director, Polymer Institute, Slovak Academy of Sciences, Dubravska Cesta, CS-842 36 Bratislava, Czechoslovakia.)

### CATALYSIS

July 2 - 6. 8th International Congress on Catalysis. Berlin, Federal Republic of Germany.
(DECHEMA, P.O. Box 970146, D-6000 Frankfurt am Main 97, Federal Republic of Germany.)

### MEDICAL POLYMERS

July 9–12. 26th Prague Microsymposium on Macromolecules: Polymers in Medicine and Biology. Prague, Czechoslovakia.
(26th Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 616, Czechoslovakia.)

### NATURAL PRODUCTS

July 9 - 14. 14th International Symposium on the Chemistry of Natural Products. Poznań, Poland.
(Prof. dr. Maciej Wiewiorowski, Institute of Bioorganic Chemistry, Polish Academy of Sciences, ul. Noskowskiego 12/14, 61-704 Poznań, Poland.)

### MACROMOLECULES

July 16–19. 27th Prague Microsymposium on Macromolecules: Physical Optics of Dynamic Phenomena and Processes in Macromolecular Systems. Prague, Czechoslovakia.
(27th Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 616, Czechoslovakia.)

### PHOTOCHEMISTRY

July 22–27, 10th IUPAC Symposium on Photochemistry. Interlaken, Switzerland.
(PD Dr. A. M. Braun, Institut de chimie physique, EPFL, Ecublens, CH-1015 Lausanne, Switzerland.)

### COORDINATION CHEMISTRY

July 29–August 3. 23rd International Conference on Coordination Chemistry. Boulder, CO, USA.
(Prof. Cortlandt Pierpont, Secretary 23rd International Conference on Coordination Chemistry, Campus Box 215, University of Colorado, Boulder, CO 80309, USA.)

### CHEMICAL THERMODYNAMICS

August 13–17. Conference on Chemical Thermodynamics. Hamilton, Canada.
(Dr. P. A. G. O'Hare, Argonne National Laboratory, Chemical Technology Division, 9700 South Cass Avenue, Argonne, IL 60439, USA.)

### NON-AQUEOUS SOLUTIONS

August 13–17. 9th International Conference on Nonaqueous Solutions. Pittsburgh, Pennsylvania, USA.
(Prof. J. F. Coetzee, Department of Chemistry, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA.)

### PHYSICAL ORGANIC CHEMISTRY

August 20–24. 7th IUPAC Conference on Physical Organic Chemistry. Aukland, New Zealand.
(Prof. B. R. Davis, Chemistry Department, University of Aukland, Private Bag, Aukland, New Zealand.)

### INSULATING CRYSTALS

August 20–24. International Conference on Defects in Insulating Crystals. Salt Lake City, Utah, USA.
(Prof. B. Henderson, Department of Pure and Applied Physics, Trinity College, University of Dublin, Dublin 2, Ireland.)

### SOLUBILITY PHENOMENA

August 21–23. 1st International Symposium on Solubility Phenomena. London, Ontario, Canada.
(Dr. M. Salomow, P.O. Box 254, Fair Haven, NJ 07703, USA.)

### COLLOIDS AND MACROMOLECULES

August 22–24. International Symposium on Physical Chemistry of Colloids and Macromolecules. Uppsala, Sweden.
(Prof. B. Ranby, Department of Polymer Technology, Royal Institute of Technology, S-100 44 Stockholm, Sweden.)

### ORGANIC SYNTHESIS

August 27–30. 5th International Conference on Organic Synthesis. Freiburg i. Br., FRG.
(Prof. H. Prinzbach, Chemisches Laboratorium, Universität Freiburg, Albertstrasse 21, D-7800 Freiburg i. Br., FRG.)

### CAROTENOIDS

August 27–31. 7th International Symposium on Carotenoids. Munich, FRG.
(Prof. W. Rau, Botanisches Institut der Universität München, Menzinger Strasse 67, D-8000 München 19, Federal Republic of Germany.)

### SOLID FILMS AND SURFACES

August 27–31. 3rd International Conference on Solid Films and Surfaces. Sydney, Australia.
(Prof. D. Haneman, School of Physics, University of New South Wales, P.O. Box 1, Kensington, N.S.W. 2033, Australia.)

### MEDICINAL CHEMISTRY

August 27–31. 8th International Symposium on Medicinal Chemistry. Uppsala, Sweden.
(8th International Symposium on Medicinal Chemistry, The Swedish Academy of Pharmaceutical Sciences, P.O. Box 1136, S-111 81 Stockholm, Sweden.)

### RAMAN SPECTROSCOPY

August 27–September 1. 9th International Conference on Raman Spectroscopy. Tokyo, Japan.
(Prof. Mitsuo Tasumi, Department of Chemistry, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

### REACTIVITY OF SOLIDS

August 27–September 1. 10th International Symposium on the Reactivity of Solids. Dijon, France.
(10e ISRS, Secrétariat Exécutif, Laboratoire de Réactivité des Solides, Faculté des Sciences Mirande, B.P. 138, F-21004 Dijon Cédex, France.)

### LUMINESCENCE SPECTROMETRY

September 3–6. International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr. W. R. G. Baeyens, Fakulteit van de Farmaceutische Wetenschappen, Laboratoria voor Farmaceutische Chemie en Ontleding van Geneesmiddeln, Harelbekestraat 72, B-9000 Gent, Belgium.)

### ORGANOSILICON CHEMISTRY

September 9–14. 7th International Symposium on Organosilicon Chemistry. Kyoto, Japan.
(Prof. M. Kumada, Chairman of VIIth ISOS, The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

### POLYMER CHEMISTRY

September 26–28. Polymer Chemistry Meeting. Leuven, Belgium.
(Dr. H. Vankerckhoven, Laboratorium voor Macromoleculaire en Organische Scheikunde, K.U. Leuven, Celestijnenlaan 200F, B-3030 Leuven (Heverlee), Belgium.)

### AUTOMATION

October 15–18. 2nd International Congress on Automation in the Clinical Laboratory. Barcelona, Spain.
(The Secretary of the Second Congress, Dr. R. Galimay, Apartado de Correos 543, Barcelona, Spain.)

### COLLABORATIVE CHEMICAL ANALYSIS

October 25–27. 2nd International Symposium on the Harmonization of Collaborative Analytical Studies. Washington, DC, USA.
(Dr. H. Egan, Laboratory of the Government Chemist, Cornwall House, Stamford Street, London SE1 9NQ, UK.)

## 1985

### POLYMER ANALYSIS

February 11–14. POLYMER 85: Characterization and Analysis of Polymers. Melbourne, Australia.
(Dr. J. H. O'Donnell, Polymer & Radiation Group, Department of Chemistry, University of Queensland, Brisbane 4067, Australia.)

### ANALYTICAL CHEMISTRY

April 15–19. 2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Pretoria, RSA.
(Dr. A. Strasheim, Department of Chemistry, University of Pretoria, Pretoria 0002, Republic of South Africa).

### POLYMER COMPOSITES

July 8–11. 28th Microsymposium on Macromolecules: Polymer Composites. Prague, Czechoslovakia.
(Dr. P. Cefelin, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 1888 Petriny, Prague 6, Czechoslovakia.)

### ORGANOMETALLIC CHEMISTRY

July 12–15. 3rd International Symposium on Organometallic Chemistry directed toward Organic Synthesis. Kyoto, Japan.
(Prof. H. Nozaki, Department of Industrial Chemistry, Kyoto University (Kogaku-Bu), Yoshida, Kyoto, 606 Japan.)

### AROMATIC COMPOUNDS

July 15–19. 5th International Symposium on Novel Aromatic Compounds. St. Andrews, UK.
(Dr. P. J. Garratt, Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, UK.)

### MYCOTOXINS AND PHYCOTOXINS

July 22–25. 6th International Symposium on Mycotoxins and Phycotoxins. Pretoria, RSA.
(Dr. P. S. Steyn, National Chemical Research Laboratory, Council for Scientific and Industrial Research, POB 395, Pretoria 0001, Republic of South Africa.)

### MACROMOLECULES

August 18–23. 30th International Symposium on Macromolecules. The Hague, Netherlands.
(Dr. J. A. M. Smit, Gorlaeus Laboratories, University of Leiden, Department of Chemistry, P.O. Box 9502, NL - 2300 RA Leiden, Netherlands.)

### CHEMICAL EDUCATION

August 18–23. 8th International Conference on Chemical Education: Widening the Scope of Chemistry. Tokyo, Japan.
(Prof. M. Oki, Department of Chemistry, Faculty of Science, The University of Tokyo, Tokyo 113, Japan.)

### THERMAL ANALYSIS

August 19–23. 8th International Conference on Thermal Analysis. Bratislava, Czechoslovakia.
(Dr. P. K. Gallagher, Rm 6D-311 Bell Laboratories, Murray Hill, New Jersey 07974, USA.)

### IUPAC CONGRESS

September 9–13. 30th International Congress of Pure and Applied Chemistry. Manchester, UK.
(The Royal Society of Chemistry, Burlington House, London, W1V 0BN, UK.)

### CHEMICAL RESOURCES OF THE OCEAN

September 22–28. Chemical Resources of the Global Oceans — CHEMRAWN IV. Massachusetts, USA.
(J. R. Moore, Director, Marine Science Institute, University of Texas, Austin, TX 78712, USA.)

## 1986

### PESTICIDE CHEMISTRY

August 10–17. 6th International Pesticide Chemistry Congress. Ottawa, Canada.
(Dr. H. V. Morley, London Research Station, Agriculture Canada, University Sub-Post Office, London, Ontario, Canada.)

### NATURAL PRODUCTS

August 17–23. 15th International Symposium on the Chemistry of Natural Products. The Hague, Netherlands.
(Prof. U. K. Pandit, Laboratorium voor Organische Scheikunde, Universiteit van Amsterdam, Nieuwe Achtergracht 129, NL-1018 WS Amsterdam, Netherlands.)

### PHYSICAL ORGANIC CHEMISTRY

August 24–29. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan.
(Prof. M. Oki, Department of Chemistry, Faculty of Science, University of Tokyo, Tokyo 113, Japan.)

# CHEMISTRY & WORLD FOOD SUPPLIES
# THE NEW FRONTIERS
## CHEMRAWN II

**Proceedings of the International Conference on Chemistry and World Food Supplies, Manila, Philippines, 6-10 December 1982**

Edited by
**L W SHEMILT**
*McMaster University, Hamilton, Ontario, Canada*

An interdisciplinary work which shows how the most modern research in chemistry, biochemistry and microbiology can be combined with new technologies in agriculture and food processing to ensure adequate food supplies for the future. The conference set the following objectives:

- To identify and put into perspective those areas of research and development having the potential to significantly increase food production and improve food storage and processing
- To strengthen scientific research in developing nations, particularly in those fields which require professional competence and initiative without excessive capital and human resources
- To accelerate implementation of research priorities and objectives by fostering cooperation among governments, industries and universities

The problem of adequate food and nutrition for the burgeoning populations in developing nations is a major one, with more than one billion people (about one-fourth of the world's population) presently known to be underfed or malnourished. These numbers and proportions may grow even faster than the world population, which is projected to rise to over six billion by the year 2000.

This is the second in the CHEMRAWN series of international meetings designed by the International Union of Pure and Applied Chemistry (IUPAC) to identify and address world needs amenable to solutions through chemistry. CHEMRAWN is IUPAC's acronym for Chemical Research Applied to World Needs. Co-sponsored by the International Rice Research Institute, this international, interdisciplinary conference brought together representatives from governments, industry and academia for the purpose of developing a strong sense of future research directions and priorities designed to meet the mounting food problem.

**Section Headings:** Soil and crop management for efficient use of water and nutrients. Integrated approaches to pest management. The role of chemistry and biochemistry in improving animal production systems. Contributions of chemistry and biochemistry to developing new and improved food sources. Chemistry and biochemistry in the processing and storage of food. Chemistry in the assessment and control of food supply. The forward edge.

X: *IUPAC Symposium Series*
600 pp June 1983
0 08 029243 7 Hardcover **£75.00 US$135.00**
0 08 029242 9 Flexicover **£42.00 US$75.00**

X = Books in series. Standing/continuation orders invited. A list of published volumes in each series is available free on request.

Prices are subject to change without notice. Sterling prices apply to UK and Eire customers only.

**PERGAMON PRESS**
Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

5A/24/7/83

A Major New Textbook For Courses In Inorganic Chemistry

# CHEMISTRY OF THE ELEMENTS

**N N GREENWOOD** and **A EARNSHAW,** *University of Leeds, UK*

## Special Features

Adopts a novel educational approach to the subject

Integrates inorganic chemistry with many related branches of chemistry, eg, analytical, industrial, organometallic, bio-inorganic, etc.

Based soundly on the chemical facts

Copiously illustrated

Incorporates topical information provided by chemically-based firms worldwide

Tackles questions usually ignored in textbooks on the subject, such as:
Where do the elements come from ?
How were they made ?
Why do they have their observed terrestrial abundances ?
What determines their atomic weights ?

This innovative textbook presents a balanced, coherent and comprehensive account of the chemistry of the elements for both undergraduate and postgraduate students. This crucial central area of chemistry is full of ingenious experiments, intriguing compounds and exciting new discoveries. The authors specifically avoid the term 'inorganic chemistry' since this evokes an outmoded view of chemistry which is no longer appropriate in the closing decades of the 20th century. Accordingly, the book covers not only the 'inorganic' chemistry of the elements, but also analytical, theoretical, industrial, organometallic, bio-inorganic and other areas of chemistry which apply.

The authors have broken with recent tradition in the teaching of their subject and adopted a new approach based on descriptive chemistry. The chemistry of the elements is still discussed within the context of an underlying theoretical framework, giving cohesion and structure to the text, but at all times the chemical facts are emphasized. Students are invited to enter the exciting world of chemical phenomena with a sound knowledge and understanding of the subject, to approach experimentation with an open mind, and to assess observations reliably. This is a book that students will not only value during their formal education, but will keep and refer to throughout their careers as chemists.

For advanced undergraduate and postgraduate courses in inorganic chemistry. Also as supplementary reading for students in analytical chemistry, biochemistry, chemical engineering, applied chemistry, industrial chemistry, fuel science, mineralogy, earth sciences, metallurgy, ceramics, solid state physics and chemistry.

**Contents:** Origin of the elements: Isotopes and atomic weights. Chemical periodicity and the periodic table. Hydrogen. Lithium, sodium, potassium, rubidium, caesium and francium. Beryllium, magnesium, calcium, strontium, barium and radium. Boron. Aluminium, gallium, indium and thallium. Carbon. Silicon. Germanium, tin and lead. Nitrogen. Phosphorus. Arsenic, antimony and bismuth. Oxygen. Sulfur. Selenium, tellurium and polonium. The halogens. The noble gases. Coordination compounds. Scandium, yttrium, lanthanum and actinium. Titanium, zirconium and hafnium. Vanadium, niobium and tantalum. Chromium, molybdenum and tungsten. Manganese, technetium and rhenium. Iron, ruthenium and osmium. Cobalt, rhodium and iridium. Nickel, palladium and platinum. Copper, silver and gold. Zinc, cadmium and mercury. The lanthanide elements. The actinide elements. Appendixes. Index.

| | |
|---|---|
| 1550 pp approx | 250x172 mm |
| 1500 lit refs approx | March 1984 |
| 0 08 022056 8 Hardcover | US $95.00 £53.00 |
| 0 08 022057 6 Flexicover | US $34.95 £19.50 |

*EDUCATORS...SEND FOR YOUR INSPECTION COPY NOW, ON 60 DAYS FREE APPROVAL.*

Sterling prices apply to UK and Eire customers only.
Prices are subject to change without notice.

**PERGAMON PRESS**

Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

CHE118/4393m/184/5A25

# PESTICIDE CHEMISTRY: HUMAN WELFARE & THE ENVIRONMENT

*Proceedings of the 5th International Congress of Pesticide Chemistry, Kyoto, Japan, 29 August - 4 September 1982*

Editors-in-Chief: **J MIYAMOTO,** *Sumitomo Chemical Co Ltd, Takarazuka, Japan* and **P C KEARNEY,** *USDA, Beltsville, MD, USA*
Editors: **P DOYLE,** *ICI Plant Protection Division, Bracknell, Berks, UK,* **T FUJITA,** *Kyoto University, Japan,* **N TAKAHASHI,** *University of Tokyo, Japan,* **S MATSUNAKA,** *Kobe University, Japan,* **D H HUTSON,** *Shell Research Ltd, Sittingbourne, Kent, UK,* **S D MURPHY,** *University of Texas Medical School, Houston, USA,* **R GREENHALGH,** *Agriculture Canada, Ottawa, Ontario, Canada,* **N DRESCHER,** *BASF Aktiengesellschaft, Limburgerhof, Federal Republic of Germany*

Covers all aspects of pesticide science, chemical and biological, and their impact on man and the environment. Over 250 papers explore the complete range of problems associated with this extremely complex and economically important industry. The synthesis, chemical structure and biological activities of various pesticides are discussed in detail. Their modes of action and toxicology in the environment are explored, both as they affect pests and other life. In keeping with the importance of government regulation, residue analysis is a further vital topic. For pesticide scientists, organic and analytical chemists, and policy makers in government and industry.

**4 Volume Set**
1750 pp approx Spring 1983

0 08 029219 4 (H) **$390.00**

Prices are subject to change without notice.
**X**: Books published in series. Standing/continuation orders are invited.

**Contents (partial):**

**Volume 1: Synthesis and Structure-Activity Relationships**
Plenary Lectures: Political, economic and philosophical aspects of pesticide use for human welfare, **K H Büchel**. Pesticide research for the improvement of human welfare, **I J Graham-Bryce.** Synthesis of Pesticides and Growth Regulators: Stereoselective synthesis of pheromones via phosphonium ylides, **H J Bestmann**. Problems and opportunities with pheromones, **R Baker.** Chemical Structure and Biological Activity: Structure-activity relationships in derivatives of anticholinesterase insecticides, **T R Fukuto**. Sulfonylureas: new high potency herbicides, **G Levitt.**

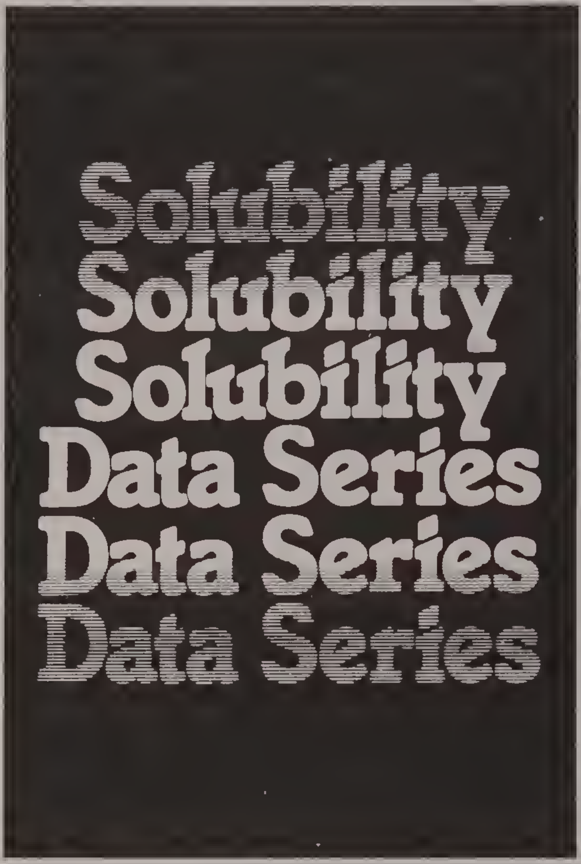
**Volume 2: Natural Products**
Bioactive Natural Products: Chemistry, Biochemistry and Physiology: Biological activities and structures of host-selective pathotoxins, **J M Daly** *et al*. Endocrine strategies for insect control, **W S Bowers**. Pyrethroid Insecticides: Biological Activity, Mode of Action, Metabolism and Toxicology. Antibiotics for Agricultural Use. Herbicides and Plant Growth Regulators for Rice Cultures.

**Volume 3: Mode of Action, Metabolism and Toxicology**
Biochemistry of Pests and Mode of Action of Pesticides: Behavioral and lethal actions of amidines on invertebrates, **R M Hollingworth.** Toxic oxygen species and herbicide action, **A D Dodge.** Metabolism and Degradation of Pesticides and Xenobiotics. Propesticides — bioactivation in pesticide design and toxicological evaluation, **J E Casida.** Selective toxicity conferred by activation, **W C Dauterman**. Toxicology of Pesticides and Xenobiotics: The role of biochemical studies in modern toxicological assessment of pesticides, **W N Aldridge.** Neurophysiological and behavioral assessment of pesticide toxicity, **A M Revzin.**

**Volume 4: Pesticide Residues and Formulation Chemistry**
Pesticide Residues and Methodology: Analysis of xenobiotics in air, **J N Seiber** *et al*. Pesticide residues in soil: problems between concept and concern, **H Frehse.** Formulation Chemistry: Dispersion science and technology in pesticide formulation, **Th F Tadros**. Developments in formulation and application technology for safe use of agrichemicals, **C Corty.**

**X**: *IUPAC Symposium Series*

**PERGAMON PRESS**
Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA



Solubility
Solubility
Solubility
Data Series
Data Series
Data Series

# SOLUBILITY DATA SERIES

The IUPAC series of critically-evaluated solubility data covering all physical and biological systems

Editor-in-Chief: A S KERTES, *Hebrew University of Jerusalem, Israel*

The *Solubility Data Series* has become established as the most authoritative and comprehensive numerical work of reference ever published on the subject of solubility. The 100 volumes to be published over the next ten years will systematically cover every solid, liquid and gas for which experimental data have been published. Data are critically evaluated paying particular attention to purity of reagents, experimental techniques and estimated errors. This multidisciplinary reference set will be essential in all libraries which serve the information needs of researchers in chemistry, chemical engineering, biology, materials science, medicine, pharmacology, the geosciences and environmental sciences.

## INDEPENDENT OPINION

"The series has no real competition and deals with a subject intensely relevant not only to chemistry, but to geophysics, pharmacology, and engineering. Major research libraries can hardly refuse to subscribe."
*Journal of the American Chemical Society*

**Subscription Information**

| | |
|---|---|
| Annual subscription (1984) | **US$1350.00** |
| Two-year rate (1984/85) | **US$2565.00** |

**Published so far**

1 Helium and Neon
2 Krypton, Xenon and Radon
3 Silver Azide, Cyanide, Cyanamides, Cyanate, Selenocyanate and Thiocyanate
4 Argon
5/6 Hydrogen and Deuterium (2 volumes priced at $200.00)
7 Oxygen and Ozone
8 Oxides of Nitrogen
9 Ethane
10 Nitrogen and Air
11 Alkali Metal, Alkaline-Earth Metal and Ammonium Halides. Amide Solvents
18 Tetraphenylborates

FORTHCOMING VOLUMES
Oxides of Sulfur; Hydrogen Halides in Non-Aqueous Solvents; Alkali Metal Halates; Lanthanide Nitrates; Methane; Carbon Dioxide; Halogenated Benzenes, Toluenes, Xylenes and Phenols; Aqueous Silver Chloride Systems; Copper, Silver and Gold Halates.

FREE SPECIMEN COPIES AVAILABLE ON REQUEST
Advertising rate card available on request. Back issues and current subscriptions are also available in microform. Prices are subject to change without notice. Journal prices include postage and insurance. Sterling prices are available to UK and Eire customers on request.

**Pergamon Press**

Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

5B/6 11.82

**Chemistry International**

is the news magazine of the

# INTERNATIONAL UNION of PURE and APPLIED CHEMISTRY (IUPAC)

---

*President:* W. G. SCHNEIDER *(Canada)*
*Vice-President:* C. N. R. RAO *(India)*
*Secretary-General:* T. S. WEST *(UK)*
*Treasurer:* A. BJÖRKMAN *(Denmark)*

**IUPAC Secretariat**
Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)

Telephone: + 44 (865) 717744
Telex: 83147 attn. IUPAC Telegrams: IUPAC OXFORD

---

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:
to promote continuing co-operation among the chemists of the member countries;
to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
to co-operate with other international organizations which deal with topics of a chemical nature;
to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 45 countries, each represented by a national organization, such as an academy of science or research council.

---

## NATIONAL MEMBER ORGANIZATIONS

Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
Asociación Química Argentina **(Argentina)**
Australian Academy of Science **(Australia)**
Verein Österreichischer Chemiker **(Austria)**
Comité National Belge de Chimie **(Belgium)**
Associação Brasileira de Química **(Brazil)**
Bulgarian Academy of Sciences **(Bulgaria)**
National Research Council of Canada **(Canada)**
Chinese Chemical Society, and Chemical Society located in Taipei, China **(China)**
Ministerio de Minas y Petróleos **(Colombia)**
Academia de Ciencias de la República de Cuba **(Cuba)**
Czechoslovak National Committee of Chemistry **(Czechoslovakia)**
Det Kongelige Danske Videnskabernes Selskab **(Denmark)**
Suomen Kemian Seura **(Finland)**
Comité National Français de la Chimie **(France)**
Deutscher Zentralausschuss für Chemie **(Federal Republic of Germany)**
Akademie der Wissenschaften der DDR **(German Democratic Republic)**
Association of Greek Chemists **(Greece)**
Hungarian Academy of Sciences **(Hungary)**
Indian National Science Academy **(India)**
Iraqi Chemical Society **(Iraq)**
Royal Irish Academy **(Ireland)**
Israel Academy of Sciences and Humanities **(Israel)**
Consiglio Nazionale delle Ricerche **(Italy)**
Science Council of Japan **(Japan)**
Malaysian Institute of Chemistry **(Malaysia)**
Koninklijke Nederlandse Chemische Vereniging **(Netherlands)**
Royal Sociey of New Zealand **(New Zealand)**
Norsk Kjemisk Selskap **(Norway)**
Sociedad Química del Perú **(Peru)**
Polska Akademia Nauk **(Poland)**
Sociedade Portuguesa de Química **(Portugal)**
Korean Chemical Society **(Republic of Korea)**
Council for Scientific and Industrial Research **(Republic of South Africa)**
Academia Republicii Socialiste România **(Romania)**
Consejo Superior de Investigaciones Científicas **(Spain)**
Svenska Nationalkommittén för Kemi **(Sweden)**
Schweizerisches Komitee für Chemie **(Switzerland)**
Supreme Council of Sciences **(Syrian Arab Republic)**
Türkiye Kimya Dearneği **(Turkey)**
Academy of Sciences of USSR **(USSR)**
Royal Society **(United Kingdom)**
National Research Council, National Academy of Sciences **(USA)**
Instituto Venezolano de Investigaciones Científicas **(Venezuela)**
Unija Hemijskih Društava Jugoslavije **(Yugoslavia)**

# Chemistry International

IUPAC

## Contents 1984, No. 2 (April)

1 Editorial
3 Summary minutes of Committee and Commission meetings
11 IUPAC-sponsored Conferences
16 ICSU/CTS Conference
18 More about The Netherlands and Utrecht
20 Recommendations on nomenclature and symbols *(more regional centres)*
21 *Pure and Applied Chemistry*
22 Meetings of IUPAC bodies 1984
24 A review of visual aids in teaching
31 IUPAC people
32 Other people's publications
33 International Standards
35 IUPAC publications; Recent reports
38 Names and addresses *(amendments to lists in CI, 1983, No. 5)*
39 Chemistry, Education and Society *(a Conference report)*
41 ICSU AB Conference
42 IUPAC Conferences

ISSN 0193

Printed by The Nuffield Press Limited, Oxford.

# Chemistry International

he news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)

1984, No.3 (June)

Pergamon Press

# CHEMISTRY INTERNATIONAL

## The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Roger Fennell
PRODUCTION EDITOR: Richard J. Palmer

## EDITORIAL ADVISORY BOARD

*Chairman:* T. S. WEST *Secretary-General*
H. EGAN *CHEMRAWN Committee*
R. DEGAIN *Committee on Chemistry and Industry*
D. P. DEN OS *Committee on Publications*
L. PAOLONI *Committee on Teaching of Chemistry*
K. L. LOENING *Interdivisional Committee on Nomenclature and Symbols*
K. S. W. SING *Division I*
E. FLUCK *Division II*
N. J. LEONARD *Division III*
M. MANDEL *Division IV*
G. DEN BOEF *Division V*
L. E. COLES *Division VI*
D. B. TONKS *Division VII*
*Secretary:* R. W. FENNELL *Editor*

## SUBSCRIPTIONS

Six issues of *Chemistry International* will be published in 1984. Annual subscription rate including postage is US$20 for individuals, and US$40 for libraries. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, UK.

## REPRODUCTION OF ARTICLES

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*. Permission to reproduce articles will normally be granted at no cost to non-profit making bodies (such as National Adhering or Associated Organizations of IUPAC, National Chemical Societies, or International Scientific Unions). Permission for commercial publishers will normally be conditional upon publication of an advertisement for IUPAC publications. In all cases, please contact the IUPAC Secretariat for clearance.

**Front cover:** Head Office of the Max-Planck-Gesellschaft, Munich *(photo courtesy of MPG-Pressestelle).*

Pergamon Press

Oxford New York Toronto Sydney Paris Frankfurt
© 1984 International Union of Pure and Applied Chemistry

# EDITORIAL

Opinions expressed here are those of the
author, and do not necessarily reflect
the views or policy of IUPAC

You probably all realize that my Editorials are, of necessity, written at the very last minute and, as I am in Oxford only one day a week, written at home. Unfortunately, sometimes I do not have time — or forget — to check the odd piece of apparent fact when I do get to Oxford, and hence yet another error gets into print. I refer this time to the third paragraph of the Editorial in CI, 1984, No. 2. A note about how to republish IUPAC reports does *not* appear on the inside front cover of PAC — yet. But you all know how it's done, I am sure.

In this issue we launch another new venture, that of publishing Newsletters — or relevant parts of them — in CI. The first example is the 1984 JCBN Newsletter. We also have a report by the Division Secretary of the Analytical Chemistry Division on some projects being pursued by the Division Committee itself — with the assistance of the Commissions, naturally. Do you feel proud enough of your Commission, Committee or whatever to want to tell the rest of us what you are doing and why? If so, send your manuscript to your Editorial Advisory Board member.

The bulk of this issue is taken up by material not of actual IUPAC origin, but rather concerning IUPAC-related bodies or subjects. Many of you will know that the Presidents of Chemical Societies were invited to sit in at the last IUPAC Council Meeting and that they had their own meeting in Copenhagen when most of us had gone back home. Two of the papers presented at that meeting appeared to be of such importance and general interest as to be well worth publishing in CI. I am, therefore, grateful to Prof. Staab, President of Gesellschaft Deutscher Chemiker, and Dr. Fritsche, Secretary of the Federation of European Chemical Societies (and also Secretary General of GDCh) for permission to reproduce these papers. Having learnt of Prof. Staab's appointment as President of the Max-Planck-Gesellschaft, it seemed appropriate to write something about that organization, which even I had heard of (but did not know much about. Did you?). Once again I am grateful to our German friends for providing the basic information.

To try to avoid the impression of a heavy German bias, we also have two, shorter, items from France — about the new French Chemical Society and the Maison de la Chimie. For these, thanks are due to a former IUPAC President, Prof. Bénard. And just to make sure that the whole issue has a sufficiently international flavour, the report of the ICSU Secretary General, Prof. Ernster, is reproduced in full.

Finally, you may recall that the revised procedure for comment and approval of IUPAC recommendations on nomenclature and symbols (CI, 1983, No. 5, pp. 42–43) was discussed at length by many IUPAC bodies and that it was agreed to put it into practice for a trial two-year period. The moment of truth has now come — we have our first report to be dealt with under the new procedure. See pp. 12–13. I wonder whether it will work — it *should*.

# Problems at the interface of educational and employment systems — A report from West Germany

**by Prof. Heinz A. Staab,**
President, Gesellschaft Deutscher Chemiker

Prof. Heinz A. Staab

When I suggested for this meeting a discussion about problems at the interface of educational and employment systems in chemistry I had in mind a really dramatic development which we observed at this interface during last year in West Germany. This development is characterized by an increase in the numbers of chemists graduating from universities and by relatively limited opportunities for these chemists to enter the employment system. In West Germany, during the whole post war period, supply and demand of chemists were fairly well balanced. Thus, it is for us an unparalleled situation for chemistry graduates from universities, even with excellent qualifications, to have considerable difficulties in finding a job. This applies to industrial positions as well as to those in the academic sector — although for somewhat different reasons, as will be seen.

Of course, some of the factors which contribute to this ever-widening discrepancy between education and employment result from trends in education policy, in demographic developments and in economy which are specific for the situation in West Germany. Nevertheless, the general tendencies might also be similar in other countries. I thought, therefore, that a discussion of this topic, with the world-wide comparison which our present meeting permits, could be helpful and of mutual interest. The Chemical Societies, as scientific organizations and as professional associations of chemists, *must* be concerned that young colleagues of ours, after long and demanding study, are faced by the depressing outlook that their skills, their knowledge and their enthusiasm to work in their field are not wanted, and that, as a result, a great innovative potential in chemistry, which for economic reasons is urgently needed, is not properly used.

Let me now introduce this topic by explaining in more detail what factors led to the difficulties we now encounter in West Germany. The most obvious factor is the drastic increase in the number of chemistry students at German universities: in 1960 the total number of German chemistry students at the university level was 8500; this number remained nearly stagnant during the 1960s, doubled in an accelerating growth from 1970 to 1980 and increased in a really dramatic way in 1981 and 1982, the number of chemistry students in 1982 being 26 000, more than three times the student number of 1960. The especially strong growth in recent years is even better reflected by the number of first-year students in chemistry: there were 1400 in 1960, 2250 in 1970, 3750 in 1980 and then, within one year, a jump to 5150 chemistry students in 1981 and another even more impressive jump to 6700 occurred in 1982. This means that the number of first-year chemistry students at German universities almost doubled in the two years from 1980 to 1982, and is now four times as high as in 1960. This increase in student numbers is by no means a specific development in chemistry but is just a single component of a huge expansion of our whole system of higher education. The total number of students at German universities grew from slightly more than 200 000 in 1960 to more than 850 000 in 1982 and most probably will reach one million during the next year — a 500% increase in less than 25 years! So the numbers mentioned for chemistry students by no means reflected a special attraction to chemistry. On the contrary, the chemistry share of the total number of university students was between 3 and 4% in the 1960s, then reduced to about 2.5% and only recently has increased again to a moderate 3%.

Before focusing again on chemistry we must take a short look at the factors which caused this tremendous increase of student numbers in Germany. Of the two factors jointly contributing to the increase in student numbers, the first is the increased tendency for the younger generation to receive university education. Whereas in 1960 about 5% of the age-group of 18–21 years attended universities, now, as a result of public promotion of higher education and of the general economic prosperity in recent years, about 20% of this age-group do so. This development coincided with a specific demographic situation as the second factor: in Germany a strong boom in birth rates started in the 1960s, with about 1 million births per year in 10 successive years. This boom was followed in the early 1970s by a steep decline to only half a million births per year, which is still about the current level. The effect of these two factors is that at the moment an especially large age-group is approaching students' age and, of this age-group, a higher proportion than ever before enters universities. The increase in student numbers which we see today as a result of these developments is, however, only the prelude to a much more serious drama to come. From the birth rates it is clear that the biggest yearly age-groups have not yet reached students' age but will stand in front of the doors of the universities in 2–4 years' time; from the proportion of these age-groups which already attend the gymnasium it can be estimated that the fraction entering the universities is more likely to increase than to remain at the present level. This means that the German universities can expect a considerable further increase of the number of first-year students up to the end of this decade. Taking into account that these age-groups will reach the interface with the employment system after an average studying time of 5–7 years, it becomes clear that we must expect, for a period of about 10–15 years, an extraordinary high pressure on the academic employment system.

It is the quantitative scope and protractedness of this problem which make solutions so extremely difficult. Government interventions to regulate admission to universities are, under our law, permitted only under strictly specified conditions. Equal opportunities for education and the right of individual choice of profession are guaranteed by our Constitution. Of course, there is some correction of the incongruity between education and employment systems by the supply-and-demand mechanism on the free market, but this mechanism does not work effectively enough because the feedback, as a result of the long gap between beginning university education and graduation from university, is too slow, and prognoses of the employment situation over such long times are necessarily only rather vague. In the specific situation given it should, however, be clear to everybody that academic positions for 20–25% of an age-group cannot be of the same type, with regard to salaries, social prestige and to the kind of work to be done, as was the case 20 years ago when only 5% of an age-group qualified for academic positions. In view of the fact that all the data are freely available, it is extremely surprising how long it takes for the public to realize this new situation. So the majority of students still enter universities with high expectations, essentially oriented to the traditional status of academic professions in earlier times. In addition, due to the demographic development, alternatives to an academic education below the university level are also crowded and, with a few exceptions, there are also poor chances for future employment in this sector. Thus attractive alternatives to a university education are not very obvious.

With these general perspectives as a background, I should now like to return to chemistry. From what we have heard, the increase of student numbers is only just beginning and this aggravates the difficulties we recently recognized at the interface of the education and employment systems. Therefore, in further discussion, we should always bear in mind that these problems are not short-term and that they must be expected to increase considerably. From the fact that the most dramatic rise in first-year students in chemistry took place only in last few years, it is clear that the full significance of the problem is not yet reflected by the numbers of those now graduating in chemistry from universities. In Germany the chemistry course, in spite of strong efforts to shorten it, is still unacceptably long; it takes on average 12½ semesters (about 6½ years) up to the diploma and 19 semesters (9½ years) up to Ph.D., which in Germany is granted to about 95% of all graduates in chemistry! So in chemistry we have to take into account an especially long delay before the high-tide of chemistry graduates is seeking employment. The problems which we see today are hardly more than the tip of an iceberg, although they are already causing us considerable concern. Recent statistics seem to indicate that there might be some relief, however, by higher drop-out quotas among first- and second-year chemistry students: obviously the quantity of students is not paralleled by their quality!

Let's now have a look at the employment market for chemists. During the years 1980 to 1982 the number of Ph.D.s graduating in chemistry from German universities was around 1000 per year (compared with about 500 20 years ago). In 1980, when supply and demand of chemists was still fairly balanced, out of these Ph.D.s about 50% joined the chemical industry directly, in addition 10–20% joined the chemical industry after one or two postdoctorate years in Germany or abroad; 10–15% started a scientific career at universities or research institutions, 7% joined laboratories within the public sector, and the rest either started a second academic study (for example, medicine) or went abroad. This was the approximate make-up of the employment market for chemists which, with slight modifications, was valid for many years. However, just now and in unfortunate coincidence with the beginning of the steep increase in the supply of chemistry graduates, all major sectors of the employment market suffer from serious restrictions. Universities, research laboratories and other public institutions, after several years of rapid expansion, are now exposed to the most severe cuts for more than 20 years, due to the critical budget situation of Federal and State Governments. In this sector there will be no new positions, and even the replacement of retired chemists will not be sure for years to come. The chemical industry, by far the major employer of chemists anyway, cannot compensate for the existing gap. On the contrary, due to market conditions and for structural reasons, the German chemical industry has reduced hiring of chemists to the lowest level for years and only covers about — if at all — the replacement of retiring chemists. German chemical industry is, to be sure, still one of the most productive branches of German industry but in recent years has suffered from the following problems: strong export-dependence (50% and more of the production is exported) and, as a consequence, strong dependence on payment problems in other countries, and, as a further consequence, high sensitivity to protectionist tendencies; strong dependence on raw materials, especially petro-chemicals, almost all of which have to be imported; high labour costs which make competiton with economies with lower labour costs — as are now starting, e.g. in the OPEC states — increasingly difficult, especially in mass products like standard plastics and fibres. With a productivity which, after several years of recession and stagnation, is only slightly increasing in 1983 and with capacities being used on average to only about 70–75%, a significant expansion in the hiring policy cannot be expected for some years. An estimate by the Association of Chemical Industry indicates that during the years 1983 to 1987 about 500 to 600 chemists per year will probably be hired, mainly as replacement for retiring people. This means that even now probably only about 50% of graduates will find a job in the industrial sector. As a consequence we see an increase in unemployment of young chemists which doubled between 1978 and 1982, when about 1500 chemists were registered as jobless, with a strongly increasing tendency.

This development has several extremely negative aspects. First of all, there is the frustrating and offensive situation for the young chemist who studied chemistry diligently, with enthusiasm and with success, and who now, at the end of his study, is forced to accept that there is no place for him to work in the profession for which he was trained. In contrast to other academic disciplines which qualify people for a broad spectrum of quite different occupations, in chemistry, due to the highly specialized education, opportunities for graduates are limited almost exclusively to the traditional chemical professions. So to get employment in a chemical position is really an existential problem. On the other hand, neither industry nor the academic sector can afford to be deprived of the cooperation, the ideas and the spirit of a whole generation of young chemists. Also, as a consequence of short periods of marked expansion which shortly afterwards slowed down considerably or even came to a complete stop, the age-structure of chemists in the universities as well as in industry is rather abnormal. As a consequence of this age-distribution, somewhat larger age-groups are due for retirement in industry from the second half of the 1980s onwards, and at the universities later still.

To bridge this gap, programmes now are under discussion between the Association of Chemical Industry, the German Chemical Society and university professors to establish additional positions in industry different from the conventional ones. For example, post-doctorate positions on the basis of 2- or 3-year contracts have been suggested; the payment would correspond to that for research assistants as universities, and these 'post-docs' would not be equipped with 4–5 technicians (as usually in German industry) but with only one or none. So the costs would be considerably reduced as compared to regular hiring. On the other hand, these post-docs would have the chance of working in their field, increasing their professional experience, and earning a reasonable salary instead of being unemployed; and, of course, they also would have a good chance to qualify for a permanent position in their company. Whether such a programme, or similar ones which are now under discussion, can be implemented within a relatively short time and to an adequate extent is not yet fully clear. Chemical industry and university chemistry, which by an old tradition in Germany have especially close contacts, agree that something in the direction mentioned above should be tried. Understandably, however, there are objections by union-like associations of chemists employed in industry who claim that existing salary contracts, and contracts about other working conditions, would be by-passed by such a programme. In this context it should be made clear that the proposals are intended only as an emergency programme, for a limited period of time, with the intention of helping young Ph.D. graduates in chemistry, who would otherwise be unemployed, and of making use of the innovative potential represented by them which otherwise would be lost for our economy. As an alternative to a programme for post-docs *in* chemical industry one might think of a post-doc programme at the universities which would be sponsored *by* the chemical industry. In view of the objections mentioned above, such a programme would be much easier to establish. Considering, however, the fact that chemistry Ph.D.s in Germany graduate on average at the age of about 30 years, it is felt that it would not be good to add even more years at the university for a relatively large group. As mentioned before, the transition from university to industry in Germany anyway is extraordinarily late, and this transition definitely would not become easier for the individual chemist if a number of post-doc years at the universities were added. This statement, of course, should not be misunderstood as an objection to post-doctoral studies abroad for exceptionally good chemistry graduates who, by the way, usually manage to finish their studies much earlier than the average.

Finally, a short look at the opportunities in academic careers should be taken. In the course of the so-called ‘reformation’ of German universities from the mid 1960s, within 15 years the permanent positions for scientists (mainly in the professorial ranks) grew by more than 400%. This expansion came, for financial reasons, to an abrupt stop in the mid 1970s and, since then, the number of positions has even decreased slightly by cancellation of positions which became vacant by retirement. So at the universities we have at present an age distribution with a strong maximum at 40 to 55, the group which assumed positions during the expansion phase. Only a relatively small number is going to retire during the next decade. We have at German universities today about 800 to 900 chemistry professors in permanent positions but in the next few years only about 15 positions per year, over all branches in chemistry, will become available for new appointees due to retirements. So the chances of success in an academic career for scientists now in the age-group of 30 to 40 years are extremely poor. For similar reasons to those discussed for the industrial positions, an emergency programme was established about 5 years ago. This ‘Heisenberg Programme’ works very well, and I should be pleased to give further details to anyone interested.

In conclusion, I should like to say that the problems we are facing at the interface between educational and employment systems are very serious — especially if you look at them from the point of view of the individual young chemist. Now, facing these problems — what should we as university professors recommend when we are asked by young students about the future prospects in chemistry? In the case of students who select chemistry as their second or third choice I feel we should strongly recommend that they should refrain from studying chemistry. We should encourage, however, those students who are strongly motivated and brilliantly gifted for our field. They deserve our full support, and I am sure that they will make their way even under much less favourable circumstances than we were accustomed to in the past!

---

## *Change of address*

Prof. C. N. R. Rao, IUPAC Vice-President, will be leaving Cambridge in the summer so that as from 1 August 1984 his address will be —

Prof. C. N. R. Rao, Solid State and Structural Chemistry Unit, Indian Institute of Science, Malleswaram, Bangalore-560012, India (TEL: 34411. TELEX: 0845-8349 IISC IN).

# The role of Chemical Societies and their international relations for the promotion of chemistry

**by Dr. Wolfgang Fritsche,**
Secretary General, Gesellschaft Deutscher Chemiker; (Secretary of the Federation of European Chemical Societies)

Dr. Wolfgang Fritsche

The exchange of scientific experience and ideas and the discussion of research results and theories has naturally served the promotion of chemistry, and has, of course, also been of benefit to the individual chemist and his work. We can, therefore, see that there has been an historical and logical development in the creation of institutionalized organizations such as the Chemical Societies as we know them today. Both in the past as well as in the present the main objectives of such societies have been the same — the promotion of chemistry and meeting the needs of chemists in the service of man, and in this respect the statutes of them all have, in principle, been consistent.

The Chemical Societies provide a forum and a communication platform for the dissemination of information about the most topical subjects of study and the most recent results of research. Chemists from universities, from industry and from government laboratories meet on this platform, as also do school teachers and chemistry students. The role of Chemical Societies in the promotion of chemistry becomes clear; their activities accelerate the progress of chemistry in fundamental research and its application in industry for the benefit of human society. I believe that there is no other scientific discipline or technology in which this invaluable effect of the Learned Societies is so evident as it is in chemistry. The present high standard of chemical knowledge and the status of the chemical industry in human society and its place in world economics provide the best proof of this statement. There are a variety of ways in which Chemical play their role in the communication of chemistry. Some of them are traditional and stem from the primary activities of the older societies immediately after their foundation in the last century. They still constitute a valuable part of the present activities, yet their importance may have changed due to the special needs of the times and sociological, scientific and environmental requirements. Additional activities developed as time went on and some have gained greater priorities during recent years. Thus Chemical Societies today provide a wide spectrum of activities, in many cases originating from very old traditions coupled with new and modern ideas. In the promotion of chemistry such societies constitute a good mixture of the old and the new, as a flexible living body, or more briefly, as modern institutions.

We should never forget that the first objective of a chemical society is the promotion of chemistry as a pure and applied science. But how can we expect to further this science without helping all those who are involved, either directly or indirectly? The individual chemists — the members of the Chemical Societies — are, consequently, the primary objects for which the activities must be designed. The improvement of their knowledge and proficiency and the assurance of their health and safety, will automatically benefit research and industrial application in general in order to cope with the needs of mankind. The intellectual gain, on the other hand, will improve the professional status of a chemist within his company, in his university or school, and in society in general. Thus, the activities of Chemical Societies also contain a professional component, which, in my opinion, has gained some importance during recent years due to unpleasant developments in the image of chemistry. The professional aspect, however, should not be overemphasized in comparison with the other activities, as otherwise the Chemical Societies would, at least in part, lose their character as Learned Societies. The activities of a professional character should consequently always, and only, be based on the scientific background represented by the society.

What are the tools Chemical Societies employ for communication in chemistry? — First of all scientific literature, the publishing of which was indeed one of the very first activities of the Societies after their founding. Almost all Chemical Societies publish a number of primary journals which are used all over the world as a source of scientific information. We are, however, all aware of the problem of proliferation of publications in chemistry as a result of the increasing and varied research activities throughout the world. Due attention has therefore been given to more modern alternatives for the so-called "primary literature", by which I mean journals containing original articles, which require more and more space in libraries.

Abstract journals also play a very important role in the activities of the large Chemical Societies and allow the fast transfer of new knowledge in chemistry on a worldwide scale. The German Chemical Society, immediately after its founding in 1867, took over publication of the *Chemisches Zentralblatt*, a journal which you will all certainly still remember. It was the first abstract journal of its type, and it set an example not only for similar abstract journals created later by other Chemical Societies in other countries, like the Chemical Abstracts Service, but also for similar journals in other disciplines of science and technology. The plethora of entries in the abstract journals — which we call "secondary literature" — increased in parallel with the development of the primary literature, and in 1970 *Chemisches Zentralblatt* appeared weekly with about 300 pages. It was one of the very few joint ventures of the Chemical Societies of the German Democratic Republic and the Federal Republic of Germany. In 1970, however, publication of this, the first abstract journal in chemistry, ceased after a successful reign of more than 100 years. It soon became evident that in this case it was not possible in Germany to make up for the aftermath of the Second World War. The journal *Chemical Abstracts*, published by the American Chemical Society, did not suffer this handicap and gained more and more prominence. It also had the advantage of the English language which rapidly became the *lingua franca* for scientists throughout the world. Finally, most of the Chemical Societies involved in secondary literature considered it justifiable to concentrate all efforts on an international scheme for the future in this sector, on the basis of the Chemical Abstracts Service. Nowadays, secondary literature is available not only on printed paper, it is also stored in computers. This enables an even faster retrieval of literature, and has the additional advantage that the individual scientist may regularly receive the literature of special interest to his work by a Selective Dissemination of Information Service.

This traditional activity of several national Chemical Societies is not only carried out with most modern methods, but it is also internationalized. In this sector the Gesellschaft Deutscher Chemiker cooperates closely with the Federal Ministry of Research and Technology and created an Information Centre on Chemistry as of 1 January 1982. From our Society, about 100 employees in the documentation and information department in Berlin, which in former years was responsible for *Chemisches Zentralblatt*, were taken over by the Information Centre.

There are, however, other ways in which Chemical Societies have taken over responsibility for the promotion of chemistry. I am thinking here of the transfer of information by means of conferences, symposia and congresses. Such organized meetings provide our colleagues with the opportunity of exchanging information about progress and developments in their special fields of work, in many cases even faster than would be possible by a time-consuming study of the literature, which, however, is indispensable. These meetings may be devoted to a narrow field of chemistry for specialists, but they can also, at larger meetings where various sections participate, cover the whole spectrum of chemistry and thus give the chemist working in a special field of research or application the possibility of brushing up his overall knowledge and widening his intellectual horizon on the very broad front of his science. Moreover, these events promote the establishment and strengthening of personal communication between chemists which often leads to a permanent exchange of experience and information. Symposia and congresses can, of course, be organized at all levels, but the value of the Chemical Societies in promoting this sort of communication is immeasurable. The Societies are in constant communication with prominent chemists who are authorities in their own field, they are continually aware of topics of interest, and above all they can provide organizational expertise. Needless to say, this activity of the Chemical Societies also requires international cooperation. There are now so many international symposia and congresses that to say that it is here that the role of Chemical Societies and their international relations becomes particularly evident is fully justified.

In-service training as a continuous process of learning during one's professional life is of the utmost importance to anybody active in the natural science and technical disciplines. This is inevitable if we reflect on the rapid rate of development we have witnessed during the last few decades. The individual chemist and all facets of chemistry have to be catered for in this continuous process of learning. It is imperative that Chemical Societies add programmes of in-service training to their traditional activities, and many societies have already done so. The German Chemical Society has done some pioneering work in this area which is internationally acknowledged as setting a good example. For 16 years we have been able to offer about 70 in-service training courses per year, covering almost all fields of chemistry and chemical technology. The courses generally last 5 days and are offered at University Institutes particularly suited for the specific theme in question. The optimal number of participants is about 25–30, and the course is usually divided into ⅓ of lectures and ⅔ of seminars or practical work. This contribution to continued communication in chemistry is more or less restricted to the activities of each national Chemical Society because of the special needs of each particular country and last but not least because of the language barrier. An international exchange of experience in this field would, however, assist other Societies in setting up similar programmes. The Federation of European Chemical Societies regularly offers such exchanges in its Working Parties. In this context, one could also think of courses approved and successful in one country being organized by the same chairmen and lecturers in suitable Institutes of other countries, particularly developing countries. I am happy to be able to report that an an experiment one of the courses of our Society, on *Selected Topics of Natural Product Chemistry*, was 'exported' to the Mahidol University in Bangkok on my initiative, and it took place successfully in March this year. We intend to continue this idea and enlarge the programme, and we hope to tap the necessary sources to finance it.

It is also a task and a challenge for Chemical Societies to take an active part in chemical education, because there the communication of chemistry begins. This is not really one of their traditional activities, but today and in future it will become more and more important. Chemistry will only flourish if, in generations to come, there are always talented and capable scientists with sound education available in the numbers required by society. This gives rise to two important aspects for the scientific societies. First of all they must assist in balancing supply and demand of chemists by analysing the present situation and extrapolating it into the future. In doing so all possible forms of influence have to be taken into consideration. The other important issue with regard to chemical education is the influence of Chemical Societies on the curricula in chemistry offered in the secondary schools and universities. In the Federal Republic of Germany considerable efforts have been made in this field by the German Chemical Society in cooperation with the responsible politicians, and other scientific and technical associations have done likewise. This to me seems to be a permanent challenge for the scientific societies, because the reservoir of a large membership offers the necessary competence to give advice to educational politicians. Taking care of the education of future scientists is, in my opinion, also a part of professional policy, since a good education ultimately guarantees the professional status of a scientist and his personal professional satisfaction. In this context I should like to mention that an admirable tradition of the Chemical Society in Germany is that the pure and theoretical chemistry practised at universities and the applied chemistry relevant to chemical industry are represented in the Chemical Society with equal rights. I believe that it is internationally known that this community is particularly good in our country in comparison with others.

All the aforementioned considerations about supply and demand of chemists and about the curricula for chemical education are much easier to realize in collaboration with the industries which employ a high proportion of the chemists and which, like no other branch of industry, are particularly scientifically minded. According to the structure of the educational system in chemistry in Germany, most of the basic research is done at the universities — there are very few major outside research institutions. Applied research, on the other hand, because of the historical background of this development, is very much regarded as a task of industry in Germany. German chemical industry developed from the rapid progress which the science of chemistry experienced 100 to 150 years ago in Germany. The connection between eminent university professors and the founders of chemical industries were extremely close. Thus basic research and industrial development proceeded closely connected but on parallel tracks. Even nowadays, the top management in chemical industry consists mainly of chemists, many of them eminent scientists. The interchange and cooperation between industry and university is still very vivid on a personal level, and industry places very high values on the transfer of new ideas from basic research at universities into application and development in industry by the Doctors in Chemistry who enter the companies. Last but not least, of course, the German Chemical Society provides the basis for communication of ideas between industrial chemists and chemists at university, and I can only recommend that the other Chemical Societies do the same.

The separation of basic and applied research between university and industry as we find it in Germany may only be beneficial in an industrially highly developed country. It is rather expensive to have basic research at universities run far in advance of the level of application in industry. In many developing countries, therefore, universities obtain research contracts with industry, and thesis work of students is done on decidedly applied topics. The strong personal relations between educational institutions and industry, which result from such communication, prove more beneficial than regimented exchange of personnel, or other rules and regulations to ensure cooperation. Educational systems have all undergone an historical development, and they also carry the stamp of the relevant cultural background. I believe, therefore, that they cannot be directly copied or transferred. The experiences may, however, be used in a modified way.

In a rather rigid system of professional qualifications, mechanisms for dynamic changes must be devised. How, for instance, should new professional opportunities be met? Normally, training and school education are expanded and modified to meet new demands in the professional field. But once in a while new developments arise which lead to the formation of new professional qualifications. Here it is important that demand should arise naturally from industrial developments. New professional activities can arise from two sources: from new developments in the professional field and/or from new developments in the scientific field. Representatives of potential future employers should at least always be consulted, or even better be directly involved, in the formation of new courses of study or training. Government agencies, schools and universities should refrain from creating new courses, leading to novel qualifications, on their own initiative. Here again, close communication between industry and educational institutions is necessary, and here again Chemical Societies can play a predominant role. Exchange of experiences and views, even across national borders, can easily take place in an informal, neutral and nonpolitical way on a bilateral basis between Chemical Societies or through international scientific organizations such as the different regional federations of chemical societies. It seems to me that any country that tends towards industrialization should strive for an educational system that holds opportunities for all young people favorably inclined towards the natural sciences. Different educational routes provide opportunities that better accommodate the differences in attitudes, abilities and possible performances of people with similar interests. Such a system may, in my opinion, therefore, serve better in socio-economic respects. But again, each country has to consider the various ways in which education and industrialization interact. Each country has to decide what to do on the basis of information about experiences in other countries. Because, as I said before, various aspects of cultural background and historical development have to be taken into account.

The professional chemist of the future will most certainly need a thorough background of scientific knowledge. But to provide scientific capability cannot be the ultimate and only goal of university chemical education. The big problems facing mankind, such as overpopulation, depletion of resources, environmental contamination, ecological imbalance, etc., demand an awareness of the contributions which could be made to their solution by application of the natural sciences. This requires adequate and good professional attitudes with regard to the impact which scientific work may have on these problems and on human society in general. A good professional attitude, however, also requires a readiness to consider safety aspects seriously. Chemical education for the future, therefore, not only means scientific training but also the formation of attitudes and awareness. The realization of this may be different in different countries. It is the task of national Chemical Societies to take care of this aspect of chemical education, too, in close communication with the relevant authorities in their countries. There will be no general recipe for the transfer of science education systems from one country to the other. Everybody will, however, benefit from a frank exchange of views and experience and from mutual assistance. There is also an opening for international communication in the field of chemical education, and this communication should by all means be initiated by the Chemical Societies.

Safety in connection with chemical activities either in the laboratory or in an industrial plant has become of increasing importance. The advancement of analytical methods makes us more and more aware of the presence of man-made chemicals, even in the remotest places of our planet. Of course, the concentrations are indeed, very low, in most cases. But, on the other hand, we all have become cautious, maybe even over cautious, concerning the effects that chemicals may have on the human population and its natural environment. If there is any hazard involved in dealing with chemicals, then of course the chemist, his co-workers in the institutes, the workmen in chemical plants, and students of chemistry are the most endangered persons. On the other hand it is again the chemist who has not only to care for his own personal security, but who is also responsible for the prevention of risks to others originating from his work. It is therefore absolutely necessary to begin with safety training the moment one starts to work actively with chemicals. These ideas are as old as chemistry.

Universities have always dealt with safe laboratory practices, beginning with the start of the first laboratory course. But the more our knowledge in chemistry, biology, medicine and toxicology increases, the more difficult it becomes even to decide where safety ends and negligence begins. In this field also the Chemical Societies are challenged to establish a rational and fruitful communication.

Whereas in the industrialized countries, as for instance in Europe, the level of scientific–technical knowledge has developed out of a comprehensive general level of education that has evolved over the course of centuries — particularly the last 150 years — in many developing countries the premises for a broad general education point in the opposite direction. The criterion applying to these countries is not only infrastructure, but a widespread illiteracy. Therefore, media such as radio and television are of a high importance. Industrialization and the transfer of science and technology for the purpose of establishing industrial sectors, and for an accompanying job-oriented university education and vocational training system, will in the long term raise the general level of education of wide sections of the population. Then communication within a given country will be easier. Giving of charity and sympathy alone to poor countries is not an appropriate means of establishing long-term cooperation on a partnership basis between industrialized and developing countries. Consequently, the communication of science and technology among nations, and particularly in the direction of the developing countries, is also a challenge for the future for Chemical Societies, to help these nations to help themselves in the long run. It is, therefore, of great importance that the national Chemical Societies exchange their views and experience for the sake of mutual benefit. IUPAC, the Federation of European Chemical Societies and the International Organization for Chemical Sciences in Development, initiated by UNESCO, are institutions designed for that task.

It is my firm belief that the communication of science and technology to politicians is also a very important issue, in order to influence their relevant decisions. This is, of course, mainly a task for the national Chemical Societies, but they can be supported by pertinent recommendations and agreements of their international umbrella organizations.

I am also convinced that information of the layman and the general public should belong to the topic "Communication of Chemistry". Although the level of this communication must be adapted to suit the public, the Chemical Societies, for the benefit of chemistry and human society, are obliged to disseminate the beneficial effects of scientific and technological effects of scientific and technological progress, particularly since certain groups make efforts to discredit this progress, progress which is in fact essential for the survival of the human race. National Chemical Societies should exchange their experience about these activities, because prejudice against chemistry seems to be a worldwide phenomenon these days. The chemical community must step out of the ivory tower of exclusivity and transfer its ideas and ways of thinking, as well as its knowledge, in a form understandable by the general public. The image of chemistry and chemists among laymen can only be improved if chemists are ready to transfer an adequate portion of their scientific and technological knowledge to the public. Chemical Societies and their international organizations are the proper spokesmen for this because of their neutral position between human society, government and chemical industry. In national efforts and in international cooperation we must find the most efficient and appropriate ways for the transfer of scientific and technological knowledge to the general public. Chemists live in their own intellectual world, and so have their particular way of communication and information transfer, meeting their special requirements. It is, therefore, justifiable for them to use this way of communication amongst themselves. However, my own experience indicates that the majority of chemists seem to have no idea of the outside world and the vital interests of the general public. This seems to be the reason for the fact that most of our colleagues are not able to translate and transfer scientific, and particularly chemical, facts into a language which will be understood by the layman. This, however, is absolutely necessary to awaken the interest of the "man in the street" in information about chemistry. Only an informed citizen will be able to give an appropriate judgement.

I wish, therefore, to make an appeal to all chemists to try to understand the world the general public lives in and to transmit the necessary knowledge in a way that can more easily be accepted and understood by the layman. I am hopeful that Chemical Societies will engage in serving this purpose. Gesellschaft Deutscher Chemiker, being aware of this necessity, has employed a permanent Press Officer from October 1980, with a secretariat. He keeps in permanent contact with the daily newspapers, radio and television, and we feel that this activity of our Society is appreciated by the mass media. We also distribute our regular press releases to the member societies of the Federation of European Chemical Societies for evaluation in their respective countries.

The titles of all press releases are published in our Society's journal *Nachrichten aus Chemie, Technik und Laboratorium* to make them available to our members for further use and for their information, to be used in personal contacts with non-chemists. Many of our members ask for copies for this purpose.

In this context I should like to give some thought to the effectiveness and impact of the different ways for information transfer to humans: reading, listening, seeing and combinations thereof. Reading requires a certain amount of intellectual effort and the readiness of the individual to become engrossed in the newspaper, the journal or the book or in a particular article or chapter thereof. This, in my opinion, requires a certain intellectual basis for the individual and the ability to process the rather abstract printed information into moulded images and concepts, understood by the individual and stored in the brain for later use. Illustrations make this process easier. Information transferred via speaking and listening, for instance by radio — if I now, in this context, do not consider listening to a lecture since I am speaking about the general public — does not require the individual attention to the extent required for reading. It is quite easy to receive some information, even more or less unintentionally, when the radio is turned on while the individual is working, while she or he is involved in housework, hobby or travelling in a car. A part of the information at least will stick. It is, therefore, important that the information is correct.

The easiest way to transfer information, particularly to the general public, is in my opinion via the audiovisual media — films and, of course, television. Human beings communicate with the world primarily by means of their eyes and, therefore, the eye is an entrance for information which is open and aware almost all the time that a human is awake. And here lie the chances and the dangers of television. Dangers, because it is so very easy to transmit sensational, influenced, untrue news and news carrying a certain colour. Television film producers, speakers and commentators, therefore, have a considerable responsibility, and only open-minded, honest and serious people with a generally good character should be employed in these media. They should follow particularly high standards of professional ethics and professional conduct, and they have to be aware of their responsibility with regard to society. To me it seems that we are still very far from this ideal situation, in which society receives objective information and is not unwillingly forced into certain patterns of behaviour. Here is a challenge for Chemical Societies for cooperation with the mass media to achieve good and effective communication, in our special case for the information of human society about chemistry and its importance in helping to provide the basis for an ever-increasing population to live under human conditions.

To conclude, please permit me to devote some thoughts to some basic principles which I consider important for international communication, particularly communication in chemistry, for which Chemical Societies must take over responsibility. International cooperation in general should always follow certain major standard concepts which, while respecting the diversity of value systems, measure up to certain universally recognized moral criteria and would therefore be acceptable to the international community at large. Thus there should be no discrimination in education, in line with the principles of the equality of all men and all women and of all peoples, as recognized in the Preamble of the Constitution of UNESCO. International cooperation should also contribute to the flow of ideas and information, the exchange of opinions, the checking of theories against experience, the assimilation of the findings of research and the general advancement of knowledge, all of which we refer to as intellectual action. Activities in the fields of science, culture, education and information should also be aimed at assisting the countries least well-endowed with resources to strengthen their educational, scientific or cultural capacities. These courses of action proceed from a basic principle of international life, according to which a lasting peace is possible only if it is based on respect for the dignity, identity and freely expressed will of all nations and is postulated on the establishment of new relations between nations that allow them, each in its own way, to follow a path of development suited to their own needs and aspirations. It is in this context that the principle of endogenous development, development in harmony with each people's cultural identity and allowing scope for manifold forms of regional and international solidarity, should acquire a predominant place in the whole concept of international cooperation.

Chemistry has no direct political role to play in the family of international organizations, but it must help to create the conditions for an equal welfare for the whole world, as a prerequisite for lasting peace among the different nations. The vision before us should be one of a world in which mutual respect with regard to cultural identity and people's dignity prevails. This means that there must be a place for solidarity, for while cultural and scientific identity and cultural and scientific specificity are fundamental features of our age, another factor must also be taken into account: with modern modes of technology and communication, the world is ceasing to be infinite and rapidly becoming finite. This *de facto* interdependence of nations and peoples is a major fact of our times, of which the simultaneous availability of information we observe today is a reflection; no people, no nation lives in isolation at present; a problem that arises in one nation is relayed around the world through the mass media; no people can any longer withdraw into itself or be unaware of the existence of other peoples of the world or the situation in which they live. We are accordingly witnessing a dual, apparently contradictory, trend: on the one hand a strengthening of cultural identity and, on the other, a growing degree of interdependence, particularly with regard to the achievements of science and technology, among the different nations of the world. This raises the problem of whether such interdependence must of necessity lead to standardization. As I see it, the fact remains that most peoples want to preserve what constitutes their identity at its deepest level, their own culture. All man's aspirations and needs, including his intellectual and spiritual ones, must be taken into account. However, international development clearly must also enable all peoples to reap the benefits of modern science and technology. It should be made clear that there is no contradiction between that requirement and the promotion of cultural identity. The fact is that neither science nor technology is neutral, they bring in their train modes of organization and patterns of thought which could vitally affect the life of any people that failed to integrate the benefits of modern science and technology into its culture in a purposeful way.

I should like to emphasize that scientists the world over are conscious of the need to place science and technology at the service of all peoples. Unfortunately, science and technology are a privilege enjoyed in a part of the world where the will to contribute to scientific and technological development of the poorest countries is not always present. All of us should endeavour to strengthen international scientific cooperation, because we do have responsibility for scientific progress and world intellectual cooperation in the domains represented by us. Scientific and technological development also presupposes the circulation of scientific and technical information, and Chemical Societies and their international organizations should continue to promote the development of scientific and technical information services in different parts of the world. All developing and industrialized countries should be given access to the scientific and technical information available in the world, and Chemical Societies are obliged to provide this communication to their utmost ability.

# PROVISIONAL RECOMMENDATIONS

## IUPAC seeks your comments

In CI, 1983, No. 5, pp. 42–43, the details of a proposed revised procedure for comment and approval of recommendations on nomenclature and symbols were given. The system has now come into operation and reproduced below is the synopsis of the first Provisional Report to be processed in this way.

It must be emphasized that copies of the full report cannot be obtained from the IUPAC Secretariat but only from your own — or the nearest to you* — national/regional centre. Copies will be sent on request, but on the understanding that comments will be sent, to the address on the document, not more than 8 months after publication of the synopsis in CI.

National/regional centres are:

**Australia and New Zealand**
Mr. R. Schoenfeld, Australian Journal of Chemistry, POB 89, 314 Albert Street, East Melbourne, Victoria 3002, Australia.

**Canada**
Prof. J. ApSimon, Department of Chemistry, Carleton University, Ottawa, Ontario K1S 5B6, Canada.

**China**
Prof. Cui Meng-yuan, Chinese Chemical Society, POB 2709, Beijing, China.
Prof. F. C. Chen, Department of Chemistry, National Taiwan University, POB 30–373, Taipei 107, Taiwan.

**Eastern Europe (Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Poland, Romania)**
Prof. E. Pungor, Altalános és Analitikai Kémiai Tanszek, Budapesti Müszaki Egyetem, Gellért tér 4, H-1521 Budapest XI, Hungary.

**France**
Prof. Y. Jeannin, Comité Nationale de la Chimie, 28 rue Saint-Dominique, F-75007 Paris, France.

**FRG, Austria and Switzerland**
Dr. W. Fritsche, Deutscher Zentralausschuss für Chemie, Postfach 900440, Varrentrappstrasse 40–42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.

**India**
Mr. A. K. Bose, Indian National Science Academy, Bahadur, Shah Zafar Marg, New Delhi-110002, India.

---

*As a last resort please write to: Dr. K. L. Loening, Chemical Abstracts Service, POB 3012, Columbus, OH 43210, USA.

**Israel**
Prof. S. Sarel, Department of Pharmaceutical Chemistry, School of Pharmacy, Hebrew University of Jerusalem, POB 12065, Jerusalem, Israel.

**Japan**
Dr. H. Hamada, Executive Director, Chemical Society of Japan, 1–5, Kanda Surugadai, Chiyoda-ku, Tokyo, 101 Japan.

**Netherlands**
Ir. E. J. de Ryck van der Gracht, Koninklijke Nederlandse Chemische Vereniging, Postbus 90613, 2509 LP Den Haag, Netherlands.

**Scandinavia**
Dr. Kurt Samuelsson, Acta Chemica Scandinavica, Wallingatan 26 A, S-111 24 Stockholm, Sweden.

**South Africa**
Dr. J. R. Bull, Organic Chemistry Division, National Chemical Research Laboratory, POB 395, Pretoria 0001, South Africa.

**UK**
Dr. I. A. Williams, Royal Society of Chemistry, Burlington House, Piccadilly, London, W1V 0BN, UK.

**USA**
Dr. Marianne Brogan, Journals Department, American Chemical Society, POB 3330, 2540 Olentangy River Road, Columbus, OH 43210, USA.

**USSR**
Prof. G. B. Bokij, Commission on Nomenclature, National Committee of Soviet Chemists, Academy of Sciences of USSR, Kosygin Street 4, SU-117977 Moscow V-334, USSR.

## Source-based nomenclature for copolymers *(Provisional)*

A new report by the IUPAC Commission on Macromolecular Nomenclature offers nomenclature recommendations intended to provide a systematic source-based procedure for naming copolymers of several different types, including the major varieties of copolymers encountered in industry and in research. The recommendations are based on and are consistent with previous IUPAC *Basic definitions of terms relating to polymers.*

Copolymers are classified as unspecified, statistical, random, alternating, periodic, block, or graft, according to the characteristic sequence arrangement of the monomeric units within the polymer molecules, and a corresponding connective or prefix is included in the name to specify this aspect of structure. The component monomer names can be in the trivial, semi-systematic, or systematic form. Provision is made for the naming of terminal units and of connecting units between segments. It is also possible to express molar masses or degrees of polymerization of segments, as well as mass fractions or mole fractions of monomeric units, by means of a short addendum to the name.

The document contains two closely-related alternative versions of the system, differing in detail, each of which has advantages in particular situations.

*Comments on this report must be received by Dr. N. M. Bikales before the end of February 1985.*

---

# LETTERS TO THE EDITOR

### *Tradition! Full Stop*

In his article with the above title (CI, 1984, No. 1, pp. 56–57), Prof. R. Battino suggested that "IUPAC should lead the way to establishing a uniform format for citing references in the body of a paper, listing references, format of tables, layout of graphs, numbering and referencing equations, tables and graphs, and the format of the references themselves."

You may like to know that when the Union's Executive Committee met at Lyngby on 23 August 1983, Past-President H. Zollinger raised the question of whether IUPAC should try to convince chemistry journal editors and book publishers throughout the world to use exactly the same system of writing literature references, instead of continuing with the several different ways currently employed.

The Executive Committee decided to ask the Publications Committee to look in some detail into the matter, to consult the Interdivisional Committee on Nomenclature and Symbols as necessary, and to report back in due course.

**M. Williams**
Executive Secretary, IUPAC

I read Prof. Battino's comments with pleasure. You may be interested to know that the editors of biochemical journals adopted a uniform style for presentation of bibliographic references in 1973. This has been accepted by all 'major' journals of biochemistry.

**Claude Liébecq**
Chairman, Committee of
Editors of Biochemical Journals,
IUB

# CREATION OF THE SOCIÉTÉ FRANÇAISE DE CHIMIE

The two oldest French learned societies in the field of chemistry — the Société Chimique de France and the Société de Chimie Physique — have recently amalgamated to form a new society, the Société Française de Chimie. The headquarters of this society are at 250 rue St. Jaques, 75005 Paris, in the building which, until now, housed the Société Chimique de France (Tel: +33 (1) 325 2078).

Following the first meeting of the Council, which was held on 22 February 1984, the Officers have been appointed as follows:

*President:* Claude Fréjacques, Membre de l'Académie des Sciences
*Vice-President:* Jacques Metzger, Professeur à l'Université de Marseille
*Secretary:* Pierre Fillet
*Treasurer:* Pierre Poirier.

Two other officials were also appointed:

*Publications Officer:* Marc Cherest
*Scientific Activities:* Clément Troyanowsky.

This attempt at centralization has been followed up in the field of publications by the grouping together of four journals which were formerly independent — *Bulletin de la Société Chimique de France, Journal de Chimique Physique, Nouveau Journal de Chimie* and *Revue de Chimie Minérale.* The Centre National de la Recherche Scientifique (CNRS) is ensuring support for this operation which will undoubtedly improve the quality and increase the readership of French chemical literature. A number of scientific meetings are foreseen in this respect; amongst these should be mentioned an important congress which will be held at Nancy, 17–20 September 1984.

---

# WHAT IS THE 'FONDATION DE LA MAISON DE LA CHIMIE'?

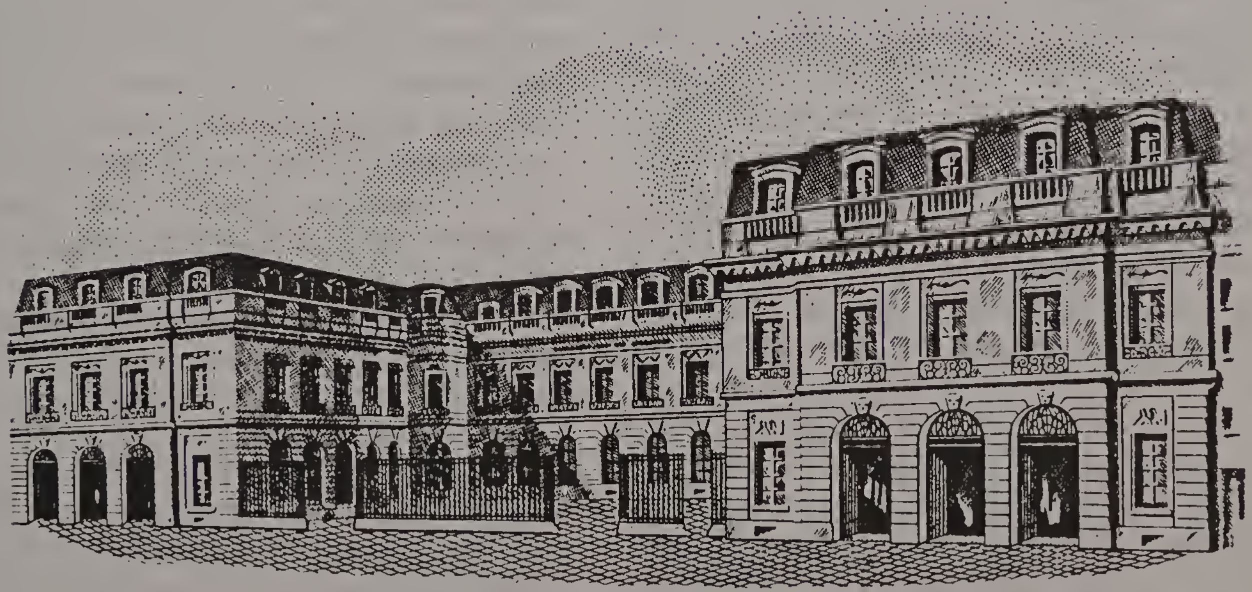
At our request, Prof. Jacques Bénard, former President of IUPAC, has sent us a note about the Fondation de la Maison de la Chimie. Jacques Bénard, Member of the Académie des Sciences, has been President of the Fondation for two years, during which time he has undertaken to restore this body as an international meeting-place for chemists, in keeping with its founders' wishes. The Golden Jubilee of the Fondation, which is to be celebrated in November 1984, will certainly provide many members of IUPAC with an opportunity of renewing their links with the mother body.

The Fondation de la Maison de la Chimie was set up in 1927, when the centenary of the birth of the great chemist, Marcelin Berthelot, was being honoured. This occasion was celebrated with due pomp and ceremony, and sponsored at the highest government level. An international Committee including distinguished personalities from many different countries had been constituted and a subscription launched, with more than 64 nations taking part. The aim of this subscription was to create in Paris, in Marcelin Berthelot's homeland, an international Centre where chemists could meet, exchange ideas and gather information. At this time — it was shortly after the First World War — many scientific circles were convinced that science would henceforth form the link between all peoples and ensure a peaceful future for mankind. We know only too well what happened to this notion! At all events that conviction, to which men of science are still deeply attached, was to give birth to the Fondation de la Maison de la Chimie. The French government offered the youthful foundation the fine historic mansion which had belonged to the La Rochefoucauld d'Estissac family, wonderfully situated in the heart of eighteenth-century Paris. The proceeds of the international subscription were devoted to building two wings, in which various lecture halls and meeting rooms were fitted out in the style of the period, inspired by the famous 'Exposition Internationale des Arts Décoratifs'.

Without any national or international subsidy, which could have guaranteed a regular source of income, the Fondation quickly found

**M. Claude Fréjacques, President of the Société Française de Chimie** *(Photo courtesy of CNRS.)*

**Prof. J. Bénard, President of IUPAC 1971-1973**



**La Maison de la Chimie**

itself (and still finds itself) faced with the necessity, if it was to survive, of extending its activities to areas of scientific and associative life other than that of chemistry. Nevertheless, and in spite of the considerable international upsets which have occurred over the years, the Maison de la Chimie has always endeavoured to remain a privileged meeting-place for chemists, whatever their country of origin.

The Maison de la Chimie currently accommodates a certain number of French institutions concerned with chemistry: le Comité National de la Chimie, la Fédération des Sociétiés de Chimie, la Société de Chimie Industrielle, le Centre National de l'Information Chimique. Many congresses and meetings are held there every day, whether organized by the authorities, or by chemical industries and learned bodies.

For some years now a special effort has been made to restore to the Fondation the international character which was intended by its founders. Chemists from all over the world should know that the Fondation can place at their disposal, in the very heart of Paris, just beside the Invalides Air Terminal, a set of rooms of varying size with up-to-date equipment, some of which can be used for simultaneous translation. Furthermore, in certain cases, apartments can be made available for distinguished visitors who wish to offer special receptions. The 'Conseil des Colloques Euchem', the 'Conseil des Unions Scientifiques Internationales' have already made use of these facilities and the management of the Fondation would be only too pleased to see the International Union of Pure and Applied Chemistry follow suit in the near future.

All members of IUPAC should bear in mind that there is in Paris a Maison de la Chimie where they can organize their meetings, thus contributing to the development of international science, in keeping with the wishes of their illustrious predecessors.

**J. Bénard**

For further information apply to: M. Amaury de la Raudière, Directeur de la Maison de la Chimie, 28 rue Saint-Dominique, 75007 Paris, France. Tel: +33 (1) 705 1073. Telex: 200.351 Chimie — Paris.

# THE MAX-PLANCK-GESELLSCHAFT AND ITS INSTITUTES

The Max-Planck-Gesellschaft (MPG) is a research organization whose member institutes (about 60, distributed all over the Federal Republic of Germany and West Berlin) carry out scientific work for the benefit of the public. The Max Planck Institutes, the majority of which concern themselves with fundamental research in the fields of medicine, biology, physics and chemistry, devote their attentions particularly to new problems which are insufficiently developed to be subjects for university research or less suited to this type of research because of their magnitude or structure. The institutes also aid university research by operating very expensive and sophisticated equipment for them.

The MPG is funded mainly by the Federal and State Governments but a significant part (nearly 10%) of its income is from non-governmental sources. This 'private' income allows considerable flexibility to the MPG and the rapid initiation of new work without public funding — although all funds are made available free from any restrictions with respect to their use, public accountability must of necessity result in some degree of rigidity in the use of funds.

The seemingly impossible marriage of public accountability and freedom of research has been achieved by the MPG through a sophisticated structure of consultative bodies, management committees and reviews of programmes of work. It is interesting to note that directors of institutes, or of divisions within an institute, are appointed only for limited terms — after which their performances are reviewed and renewal, or otherwise, of their appointments is decided. Similarly, even institutes themselves may be closed down if their research programmes have either been taken over by a university or by industry — or have been successfully concluded. Thus there are apparently no self-perpetuating empires to be built in the MPG!

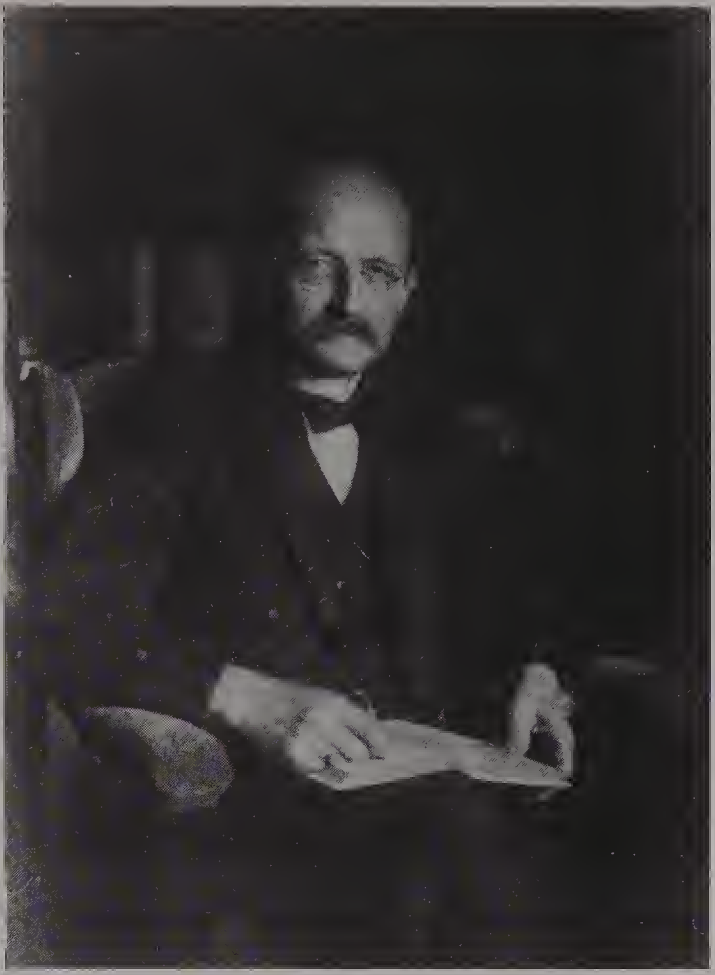
The highest authority of the Society is the meeting of its members — appointed Scientific Members and Supporting Members, i.e. those who provide research funds on a continuous basis — the General Assembly. This gathering not only reviews the annual accounts and the actions of the various bodies of the Society but also elects the members of the Senate — the central decision-making body. The elected Senators include politicians, journalists, trades unionists, people from industry and universities, and some from MPG itself. *Ex officio* members include three ministers from the Federal States and two from the Federal Government, as well as the President and other senior Officers of the MPG. The importance of this body to the Society may be assessed by a look at some of its functions:

the establishment, closure or re-orientation of institutes and autonomous divisions, including decisions concerning the incorporation of new lines of research;
the appointment of Scientific Members, directors of institutes and heads of autonomous divisions:
the election of the President and the Executive Committee;
the adoption of the budget and other decisions relating to the use of funds;
the approval of the statutes of the institutes.

The central scientific body of the MPG is its Scientific Council. It is composed of all the Scientific Members elected by the Senate and one member of each institute, elected by its staff. The Scientific Council has three sections — Biology and Medicine; Chemistry, Physics and Technology; and Humanities. Depending upon their main activities, the institutes are assigned to one or other of these sections. The sections discuss problems common to their (assigned) institutes and recommend policy to the Senate, for example, the appointment of new scientists or the establishment or closure of institutes or divisions. Preparation of these recommendations usually involves taking advice from experts outside MPG, both in Germany and abroad.

With such an impressive structure for management and control, by means of *scientific* review of programmes and progress, and the attraction that the MPG has for the best scientific brains, it is hardly surprising that the work of the institutes is held in such high regard. It is of this organization that Prof. Heinz A. Staab, currently President of Gesellschaft Deutscher Chemiker (and author of the article on pp. 2–5), has been elected President.

How did all this come about? It appears that in the early 1900s a move started to develop a scientific centre — initially based on the science institutes of the University of Berlin — in the royal domain of Dahlem. At the centenary of the University of Berlin, in October 1910, Kaiser Wilhelm II urged the establishment of "a society under my auspices and in my name which would be concerned with setting up and maintaining research institutes." In January 1911 the Kaiser-Wilhelm-Gesellschaft (KWG) was founded and in October 1912 the first two institutes to be inaugurated were those for Chemistry and for Physical Chemistry and Electrochemistry, at Dahlem. In 1920, because of the galloping inflation in Germany at the time, the Government agreed to make major contributions towards running costs — and 15 Senators were henceforth Government nominees. The number of institutes continued to grow — 19 in 1921, 30 in 1928, 32 in 1936.



Professor Max Planck

In 1930 Max Planck took over the Presidency, on the death of Adolf von Harnack after 19 years in office, and was succeeded by the Nobel prizewinning chemist Carl Bosch. The KWG was able to continue basic research during the war, on the insistence of its President, Albert Vögler, who died in 1945. At the end of the war, Max Planck and Ernst Telschow, Secretary General of KWG, set about reorganizing what remained of the institutes that had been moved to the western zones of occupation and in 1946 the MPG was established, at Bad Driburg, but had to restrict its activities to the British zone. In 1948, the present form of the MPG was founded, at Göttingen, to maintain the institutes of the KWG, with the chemist Otto Hahn as President. The Society was credited with 24 institutes and research units that year and in 1950, 34 institutes were listed. In 1960 the MPG had 40 institutes and about 3000 full-time employees. The phase of expansion ended in 1972, however. From that time new institutes could still be founded — on average about one per year have been — but only by closing others.

# International Council of Scientific Unions (ICSU)

## Report of the Secretary General (29 February 1984)

The concern of ICSU for increased scientific activity at the time of essentially administrative meetings has been growing for several years. Evidence of this is the number of scientific lectures and other scientific activities at the time of the ICSU General Assemblies. In 1983 for the first time a scientific colloquium was organized in Warsaw within the framework of the meeting of the General Committee. This was on the subject of Global Change and brought together representatives from a wide range of organizations interested in the preliminary proposals for such an international interdisciplinary programme (see page 20).

The General Committee held its first meeting in Poland at the Staszic Palace in Warsaw in August. The Seychelles National Environment Commission was accepted as a National Associate. Following discussions in the Subcommittee on Scientific Priorities, it was decided: (1) to review, in September 1984, ICSU's participation in COWAR because, since becoming a joint Committee of ICSU and UATI, the Committee has not functioned as effectively as had been hoped and the expected increased interaction between engineers and scientists has not been forthcoming; (2) to recommend to the General Assembly that the status of the ICSU Abstracting Board as a Permanent Service of ICSU be terminated and that appropriate modes of cooperation between ICSU AB and the ICSU family be determined after the Abstracting Board has held its Full Board meeting in 1984 and established its new structure and objectives.

The General Committee also urged all members of the ICSU family to send appropriate proposals to the special committee set up by the Executive Board to make an assessment of the biological, medical and physical effects of the large-scale use of nuclear weapons, and to give their full approval and support to the SCOPE study on the environmental consequences of nuclear war (ENUWAR).

The General Committee agreed to a proposal from the Subcommittee on Scientific Priorities that it should review the activities of all ICSU Committees, Commissions, Permanent Services, etc., about once every three years. This will form part of an overall ongoing assessment of ICSU's past, present and future activities.

### International Scientific Unions

Six of the twenty international Scientific Unions held their General Assemblies and/or Congresses during the course of the year. The first was the 29th International Congress of Pure and Applied Chemistry in Cologne (FRG) in June followed by the 7th International Congress for Logic, Methodology and Philosophy of Science in Salzburg in July.

In August the IUGG held its 18th General Assembly in Hamburg. This included a number of inter-Association Symposia and a special ceremony to commemorate the anniversaries of the three International Polar Years. Almost simultaneously the IMU held its International Congress of Mathematicians in Warsaw (after a year's delay), the IUPAC held its 32nd General Assembly in Lyngby/Copenhagen and the IUIS organized the 5th International Congress of Immunology in Kyoto. From 28 August to 3 September the IUPS held its 29th International Congress in Sydney. The Commission for the Geological Map of the World of IUGS held its Plenary Assembly in Paris in January.

Several other large congresses, symposia or meetings were organized throughout the year, such as Oils, Fats and Waxes and the Biology of Deer Production, both in New Zealand, Bioinorganic Chemistry in Florence, Ion Beam Analysis in Arizona, Acoustics in Paris, Microbial Ecology in East Lansing, Genetics in New Delhi, Limnology in Lyon/Villeurbanne, Mycology in Tokyo, Analytical Chemistry in Edinburgh, Cosmic Rays in Bangalore, Macromolecules in Bucharest, Proterozoic '83 in Lusaka, etc.

Several regional meetings were held, for example Phosphate Rock Potential in South East Asia in Bangkok, European Meeting of Sedimentologists in Split, 4th European Nutrition Congress in Amsterdam, 15th Meeting of FEBS in Brussels, 3rd FAOB Congress in Bangkok, 7th European Regional Astronomy meeting in Florence, 2nd Middle East Geological Congress in Baghdad, etc.

Several meetings were organized by two or more Unions, some with the cosponsorship of UN Agencies such as Karst Hydrology of the Caribbean Region in Havana with IUGG, IUGS and UNESCO, Methods and Instruments for the Investigation of Groundwater Systems in Noordwijkerhout with IUGG, IUGS and UNESCO, Unstable Current Systems and Plasma Instabilities in Astrophysics in College Park with IAU, IUGG, COSPAR and SCOSTEP, and on Earth Radiation Budget: Operational and Research Programmes in Alpbach with IUGG, COSPAR and WMO. The second workshop on MERIT (a programme of international collaboration to Monitor Earth Rotation and Intercompare the Techniques of observation and analysis) was held in Herstmonceux in May. The observational period began on 1 September and will run to 31 October 1984.

### Scientific Associates

Five of the Scientific Associates held their Assemblies or Congresses during the year. The International Federation for Information Processing held its Congress in Paris, the Pacific Science Congress was held in Dunedin and was concerned with Conservation, Development and Utilization of the Resources of the Pacific. The International Statistical Institute held its 44th Biennial Session in Madrid and the International Federation of Library Associations and Institutions its General Conference in Montreal. The International Union of Food Science and Technology held its 6th Congress in Dublin under the general heading Food Science and Technology for Development, Welfare and Peace.

Two of the Scientific Associates, IFIP and IFAC, together with the International Federation of Operational Research Societies held a joint symposium on Control in Transportation Systems in Baden-Baden.

### Committees, Commissions and Services

SCAR, together with SCOR and IUBS, organized in Wilderness the 4th Symposium on Antarctic Biology on the theme Nutrient Cycles and Food Chains in the Antarctic. The SCAR Working Group on Human Biology and Medicine met in Paris in January.

COSPAR organized several symposia and meetings, alone, with the Unions or with other bodies such as the European Space Agency. In February in New Delhi with URSI on Beacon Satellite Studies of the Earth's Environment, in Schwerin in May on Ground-based Studies of the Middle Atmosphere, in College Park in August with IAU, IAGA of IUGG and SCOSTEP on Unstable Current Systems and Plasma Instabilities in Astrophysics, on Earth Radiation Budget: Operational Research Programmes with IAMAP of IUGG and Satellite Vertical Soundings — comparison with ground-based observations in ALPEX with IAMAP of IUGG and WMO. These last two were both organized in Igls.

COSPAR is in the process of organizing with IAMAP and UNEP an International Satellite Land Surface Climatology Project (ISLSCP) within the framework of the World Climate Impact Programme (WCIP). Two workshops were held, in Boulder and Innsbruck, and a two-day briefing session in New Delhi to define the programme of research, which will lead to the development of standard methodologies for converting satellite measured radiances into quantitative data concerning the Earth's surface.

SCOSTEP held a meeting of its Bureau in Baltimore in June and a number of workshops in relation to the ongoing SCOSTEP Programmes and in particular the Middle Atmosphere Programme (MAP).

CODATA organized a planning conference in La Gaillarde in June to review its accomplishments and assess new needs and opportunities for the next 10–20 years. CODATA continued in the preparation and publication of the CODATA/UNESCO *Inventory of Data Sources in Science and Technology*. A meeting of the CODATA Task Group on a Hybridoma and Monoclonal Antibodies Data Bank met in Geneva in January. Following this meeting a contract was signed to establish such a data bank in Bethesda, USA. The Committee organized with UNESCO a training course in Accessibility and Dissemination of Non-Bibliographic Data in Science and Technology, at Hasselby Slot near Stockholm in October.

SCOPE initiated in 1983 an International Assessment of the Environmental Consequences of Nuclear War. The first workshop was held in Stockholm in November and considered: (a) physical and chemical atmospheric effects and climate; (b) biological impacts. SCOPE also organized Mussel Watch II — Chemical Changes in the Coastal Zone in Honolulu in November, and in association with UNEP and UNESCO an International Conference on Environmental Hazards of Agrochemicals in Developing Countries in Alexandria in November. Within the framework of the continuing studies on biogeochemical cycles a workshop on Stable Isotopes in the Assessment of Natural and Anthropogenic Sulphur in the Environment was held in Pushchino in September.

COGENE organized a Symposium on Genetic Manipulation: Impact on Man and Society in Cologne in April. This was preceded by the meeting of the Committee, which considered new programmes particularly in relation to problems in medicine and agriculture. The Committee also organized three training courses in Hong Kong, Costa Rica and Tunis.

The Standing Committee on the Free Circulation of Scientists met in Warsaw in August. One of the main items was the consideration of the Visa Application Form which had already been circulated to ICSU Members and which has already been adopted by a few Members. The Committee also examined 18 new cases of problems of exit or entry visas. The majority of these had been resolved and in several of those not resolved it was because the time available after notification had been insufficient to take adequate, appropriate action.

The Standing Committee on the Safeguard of the Pursuit of Science met in the ICSU Secretariat in June. The Committee has been active in a number of fields: (a) it had tried to make contacts with human rights groups in National Members' countries but with practically zero reactions; (b) because the meeting on European Society and Cooperation appeared to be coming to a successful conclusion and as the human rights' question would be taken up at a special meeting in 1986, it suggests that ICSU should consider the possibility of providing National Members with information concerning human rights and scientists; (c) the question of the brain drain had been considered and the members from developing countries had indicated the need for a developing country approach but one that would not duplicate COSTED's work. A draft set of principles had been prepared and this was tabled at the meeting with an invitation to the members of the General Committee to send comments to SCSPS. The Committee had also considered the manpower problem and urged that governments, international scientific unions, professional societies and universities recognize the problem and seek ways to damp the effects of supply and demand for scientists of various kinds. The Committee had also decided to appeal to the Executive Board to take certain actions to try to assist scientists who had disappeared.

The Inter-Union Commission on the Lithosphere organized, at the time of the IUGG General Assembly in August in Hamburg, a number of meetings and in March in London (UK) and Strasbourg, respectively, symposia on Mantle, Oceanic and Continental Crust and Formation of Magnas and on Paleo-environment and Productivity of the Cenozoic Ocean.

The Inter-Union Commission on the Application of Science to Agriculture, Forestry and Aquaculture met in London in July. The Commission examined about 60 suggestions for scientific studies that need action which had been received from the International Agricultural Research Centres and developing countries. Seven of these were given first priority because they were: (a) in the fields of competence of CASAFA; (b) of pressing importance; and (c) sufficient detail had been provided to allow scientists to begin work immediately. The meeting also decided to invite ICSU National Members to establish National Committees or appoint National Correspondents and to make contributions to CASAFA's central funds.

The *ad hoc* Committee on the Disposal of Toxic Waste met in July in the Secretariat. The Committee decided to limit its study to the disposal of toxic wastes that result from human activities and not to take into consideration hazardous wastes in general.

The *ad hoc* Committee on Structure and Statutes held meetings in Stockholm in January and in Oxford in May. At the first meeting the Statutes and Rules of Procedure were reviewed and the need for modifications in the structure of ICSU was considered. The meeting in May examined a revised version of the Statutes and Rules of Procedure — which were later sent to the Members of the General Committee for comments — and made a number of proposals for increasing the scientific content of the General Assembly by reducing unnecessary attention to administration and for a multidisciplinary scientific symposium during the 20th session of the General Assembly in September 1984. An Organizing Committee for this symposium held a meeting in Paris in November and suggested that the Symposium have three themes: (1) Global Changes; (2) Gene Technology; (3) Teaching of Science.

### Education

The Committee on the Teaching of Science met in Malvern in March to continue preparations for the Conference on Science and Technology Education and Future Human Needs to be held in Bangalore in August 1985. At the time of the CTS meeting, a seminar was held devoted to the encouragement of the development of science education more relevant to the needs of society, and to review the development of educational materials since 1980.

A workshop on geoscience curricula in South-East Asia was held in Chieng Mai in January organized by IUGS, AGID and the S.E. Asian Region Network for Geosciences (SEARNG). Chieng Mai was also the scene of a meeting on Methods of Teaching Earth Sciences in Asian High Schools organized by IUGS and AGID.

The International Commission on Mathematical Instruction (ICMI) of IMU sponsored a conference in Tokyo in October on School Mathematics in and for Changing Societies. ICMI began work on a series of four studies on: (i) Mathematics, Computers and Computation; (ii) Mathematics and Cognition; (iii) School Mathematics in the 1990's; and (iv) Mathematics as a service subject — in cooperation with CTS. Each of these is being built around a seminar with a published report as the end product.

IUNS co-sponsored with UNESCO an international conference on New Developments in Nutrition Education in London (UK) in July. COSTED arranged training workshops in Bangalore on Microprocessor-based Instrumentation and in Ibadan on Nutrition, both in February. IUCr arranged its annual summer school on crystallographic computing in Kyoto in August.

### The Proposed International Geosphere-Biosphere Programme: Global Change

Within the framework of the Warsaw meeting of the General Committee a Colloquium was held on Global Change as indicated on page 18. The Colloquium recommended that an *ad hoc* Committee be established to carry out a study of those aspects of Global Change which are not yet adequately covered, to prepare an inventory of existing programmes and their inter-relations, and to make recommendations to the 20th General Assembly for further planning in fields that are interdisciplinary and require international cooperation. The report of the meeting is available from the ICSU Secretariat. The Moderator of the Colloquium presented a brief report on the Workshop held on 25–29 July in Woods Hole and organized by the US National Academy of Sciences. The report of this Workshop is available from the Academy.

A meeting of a group of experts was held in November in Paris to consider further the programme and to begin the preparations for the Symposium on Global Change to be held in Ottawa on 25 September 1984. The subjects put forward for possible presentations include: Lithosphere; Oceans; Biosphere; Atmosphere; STR; Biogeochemical Cycles; Tropospheric Chemistry; Atmosphere/Ocean/Lithosphere Interactions; Biosphere/Climate Interactions; Coupling Sun-Earth Systems; Information/Communication; Observational Systems/Techniques (Remote Sensing); Dynamics; History of Global Change; Perspectives on Global Change Natural and Anthropogenic. The intention is to have the presentations published by ICSU Press and distributed to participants prior to the start of the Assembly.

### Relations with International Organizations

UNESCO

In addition to the daily close contacts between the staffs of ICSU and UNESCO and the formal meetings of the ICSU–UNESCO Coordinating Committee, a new system of monthly meetings has been instituted at which the Assistant Director-General for Science of UNESCO and some of his staff meet with the ICSU staff and visiting Officers to discuss ongoing cooperation.

ICSU was represented by a large delegation at the

20th UNESCO General Conference. ICSU representatives intervened in all the discussions on the programmes concerning the Science Sector. ICSU also sent representatives to a wide range of meetings organized by UNESCO and UNESCO sent representatives to a large number of meetings organized by members of the ICSU family.

IBN: Within the famework of the joint ICSU–UNESCO International Biosciences Networks considerable progress was made. Within the framework of the African Biosciences Network (ABN), and in collaboration with CASAFA, a workshop on the Biology and Control of the parasitic weed *Striga* was held in Dakar in November. A part-time Coordinator for Africa has been appointed whose office is located in the UNESCO Regional Office in Dakar and the ABN began full operation with funds made available from UNDP.

The Asian Network for Biological Sciences held its Council meeting in Bangkok in April and held its elections of Officers and Council. The ANBS also organized meetings or workshops on Research in Biology and Biotechnology in Developing Countries in Singapore and on Large Urban Systems in Tropical Zones in Kuala Lumpur — both in November — and on Ecological Aspects of Solid Waste Disposal in Hong Kong in December.

An Inter-Regional Symposium on Savanna and Woodland Ecosystems in Tropical America and Africa: A Comparison was organized in Brasilia in October by the Latin American and African Networks. The IBN Steering Committee met just prior to the Symposium in Rio de Janeiro. The creation of the Arab States Biosciences Network was initiated at a Symposium on the State of Biology in Arab States held in Baghdad in December.

CCCO: The Joint ICSU–SCOR/UNESCO–IOC Committee on Climatic Changes and the Ocean held its fourth session in January in Paris. The Committee discussed, among other things, plans for the World Ocean Circulation Experiment (WOCE) and the Tropical Oceans and Global Atmosphere (TOGA) experiments. The fifth meeting was held in Abingdon, UK, in December at which offers for the establishment of a TOGA office in the USA and a WOCE office in the UK were tentatively accepted.

WMO

The Secretary-General, Treasurer and Executive Secretary represented ICSU at a meeting held in the Secretariat of WMO to discuss the participation of ICSU in the World Climate Programme with representatives of WMO, UNEP and UNESCO. Cooperation with WMO both within the framework of the joint ICSU/WMO World Climate Research Programme (WCRP) and in many other fields of atmospheric sciences continues closely.

The Joint Scientific Committee (JSC) for the WCRP held its fourth meeting in Venice where particular attention was given to hydrological processes and evaporation. The JSC also established a distinction between three streams of climate research according to different time-scales and different types of climate predictions.

JSC and the corresponding Committee on Climatic Changes and the Ocean of SCOR and IOC, jointly established scientific steering groups for the two major large-scale oceanographic experiments planned within WCRP. The WOCE Steering Group held its first meeting in August (Woods Hole) and the TOGA Group in September (Hamburg). JSC and CCCO also established a joint Working Group on Satellite Observing Systems for Climate Research which held its first meeting in Abingdon, UK, in late June.

Two meetings of experts were sponsored by the IAMAP Radiation Commission, WMO and COSPAR in Igls, Austria, in August to compare inversion methods for temperature profiles soundings from space and discuss radiation budget data requirements. The International Satellite Cloud Climatology Project has effectively started collecting geostationary and polar orbiting satellite data from July 1983.

A Study Conference on the Impact of Climatic Change on Natural and Managed Terrestrial Ecosystems organized jointly by ICSU, UNEP and the WMO was held in Villach in September. The report of the Conference will be published early in 1984.

COUNCIL OF EUROPE

ICSU gave its patronage to a Colloquy on Oceanography organized by the Council of Europe in Strasbourg in June. This brought together oceanographers from both East and West Europe and led to a proposal to form an organization of Directors of European Oceanographic Laboratories.

CISTOD

The Confederation of International Scientific and Technical Organizations for Development held in Tunis in April its first World Congress on Interdependence and Self Reliance: the Promises and Limitations of Science and Technology and the Roles of the Non-governmental Organizations Acting in Concert.

### Publications

The Executive Board at its meeting in January decided that as progress in establishing the ICSU Press had been much more rapid than foreseen to authorize in principle the creation of the ICSU Press. The ICSU Press began its publishing programme with the proceedings of the COGENE Conference: *Genetic Manipulation — its Impact on Man and Society*. Work also began on a series of semi-popular science books, the first of which will be *The Mysteries of the Four Seasons,* and also short reports — or extended abstracts — of scientific meetings. The ICSU Press is also preparing to launch a new scientific journal *BioEssays*.

Four issues of the *ICSU Newsletter* were published in February, May, September and December. The plans for the preparation of the *ICSU Year Book* 1983 on the office word processor met with delays and it was decided to publish a 1983–1984 version early in 1984.

### ICSU 20th General Assembly, 1984

The programme of the ICSU 20th General Assembly has now been decided in consultation with the Canadian National Research Council. The Assembly will begin on 23 September and will terminate on 28 September. An interdisciplinary Symposium will be held with two sessions on 25 September devoted to Global Change, one one 26 September on the Teaching of Science and one on 27 September devoted to Gene Technology.

**Secretariat**

Apart from one change in staff the Secretariat remains stable and responsive to the large demands made on it.

I should like to express in closing the thanks of ICSU and a number of Members of the ICSU family to the Académie des Sciences and to the French authorities for making available at a modest rent the Hôtel de Noailles and a special subvention to ICSU, which reimburses ICSU, in part, for the increased costs of locating the Secretariat in Paris.

I should also like to thank UNESCO for making available office space and equipment in its Headquarters in rue Miollis.

**L. Ernster**

A photograph of Prof. L. Ernster appeared in CI, 1983, No. 4, p. 26.

# REVISIONS TO SCHEDULE OF 1984 MEETINGS OF IUPAC BODIES

| IUPAC Body | Location | Date |
|---|---|---|
| **Physical Chemistry Division (I)** | | |
| Subcommittee on Plasma Chemistry | Tilton (USA) | Between 13–17 August during Gordon Conference |
| Subcommittee on Catalyst Characterization | Berlin (FRG) | 6–7 July |
| **Organic Chemistry Division (III)** | | |
| Commission on Physical Organic Chemistry (III.2) | Burlington (USA) | 8–11 August |
| Joint Working Party on Stereochemistry | Burlington (USA) | 6–7 August |
| **Macromolecular Division (IV)** | | |
| Working Party on Structure and Properties of Commercial Polymers | Wilmington (USA) | 2–4 October |
| **Analytical Chemistry Division (V)** | | |
| Commission on Electroanalytical Chemistry (V.5) | Jülich (FRG) | 23–24 October |
| Subcommittee on Electroanalytical Methods of Trace Analysis | Jülich (FRG) | 23–24 October |
| **Applied Chemistry Division (VI)** | | |
| Commission on Food Chemistry (VI.1) | Washington (USA) | 22–24 October |
| **Clinical Chemistry Division (VII)** | | |
| Subcommittee on Toxicology of Selenium | Beijing (China) | Between 28 May and 2 June, during 2nd Int. Symp. on Selenium in Biology and Medicine |

# Some remarks on activities of the Analytical Chemistry Division (Division V)

The Analytical Chemistry Division is one of the largest Divisions of the Union. More than 200 analytical chemists are involved in its work, divided into 8 Commissions, some of them specialized in certain fields of analytical chemistry, such as —

V.4 Spectrochemical Analysis,
V.5 Electroanalytical Chemistry,
V.7 Radiochemical Analysis (at present under review), whereas others are oriented on special problems —
V.1 Analytical Reactions and Reagents,
V.2 Microchemical and Trace Analysis,
V.3 Analytical Nomenclature,
V.6 Equilibrium Data,
V.8 Solubility Data.

Apart from its work in specialized Commissions, the Division is involved in, or contributes to, a number of projects of a more general analytical character. Firstly, there is the Division project on the determination of trace elements in natural waters. The quality control of natural waters is a problem of world-wide interest for industrialized as well as developing countries, and quite clearly also for parts of the world not under the control of a single nation, e.g. the oceans and polar areas. The problems differ from country to country (area to area) as well as the means available to solve them. The Analytical Chemistry Division decided to try to exploit the expertise available within the Division by asking a number of its Commissions to select, from the existing literature, methods for analysis for a number of trace elements which, to the best of their knowledge, are most suited for natural waters. It was therefore not the aim to carry out experimental work but to rely on published reports. Furthermore, it was decided not to include only the more sophisticated methods for trace analysis, as in many countries, or under certain circumstances, only simple equipment for analysis will be available. Hence, spectrophotometric methods will be provided as well as electrochemical and spectrochemical methods. It is expected that a first publication of this project will appear in 1984. The Division project leader is Prof. H. W. Nürnberg. He cooperates with the leaders of the various parts of the project. Programmes of a similar character might be initiated in the near future.

**Prof. G. den Boef, Secretary, Division V**

Secondly there is the revision of the *Compendium of Analytical Nomenclature* (Orange Book). A second edition of the Orange Book is scheduled to be available in 1984 under the editorship of Prof. H. Freiser, with the cooperation of Profs. S. Perone and G. Nancollas.

A third Division project is the *Multilingual Dictionary of Analytical Chemistry.* The purpose of this project is to provide a list of terms in English, important in analytical chemistry, with on the one hand a definition of the term in English and on the other its translation into other languages. Prof. E. Pungor coordinates this project. It seems a huge task, which will not be completed in one step, but it is of great importance for mutual understanding. The first results of the efforts of the contributors will become visible in 1984.

A last Division activity is the contribution of the Division to the problem of Harmonization of

Analytical Studies, which is a joint project of the Analytical, Applied and Clinical Chemistry Divisions. The aim of the project — as has already been published in these columns (CI, 1983, No. 5, p. 63) — is "to identify the design essential for the validation of the performance of analytical methods; to identify, where possible, the minimum criteria for an interlaboratory study for validation in the light of the above, and to compare the above design factors and criteria, as identified by various competent international organizations, with the view to their harmonization on an international basis". For the Analytical Chemistry Division Prof. F. Pellerin is responsible for this project. A joint meeting on this subject will take place in Washington, DC, USA, in October 1984.

**G. den Boef**

---

# IUB - IUPAC Joint Commission on Biochemical Nomenclature (JCBN) Newsletter 1984

JCBN and the Nomenclature Committee of IUB regularly produce Newsletters about their work to keep the biochemical community informed. They are intended to call attention to features of recommendations that are recently published or are in press. It has been agreed that the more chemically-oriented parts of these Newsletters should be published in CI for the information of those of us that do not read the biochemical literature. Comments on any item in this Newsletter, or on any other aspect of biochemical nomenclature, should be sent to the JCBN Secretary, Dr. A. Cornish-Bowden.

## Amino acids and peptides

Recommendations for naming and symbolizing amino acids and peptides have been published (see p. 32). They combine and extend earlier recommendations rather than break new ground, but they attempt to tidy up and clarify a number of points. Some of their features are given below.

### Three-letter symbols

The basic system remains as before, so that Ala represents alanine, addition of a hyphen on the left represents removal of H from its amino group, and addition of a hyphen on its right represents removal of OH from its carboxyl group. Hence -Ala- represents an alanine residue within a peptide chain, and Ala-$NH_2$ or H-Ala-$NH_2$ represents alanine amide. Although it would be possible in this system to use the symbol $NH_2$-Ala to represent the hydrazine $NH_2$ -NH-CH($CH_3$)-COOH, such a usage would be confusing, as many authors incorrectly write an N-terminal alanine in this way. The N-terminal residue should normally be written as Ala-, but the recommendations point out that it may sometimes be convenient to show it as H-Ala- to contrast with substituted residues such as Ac-Ala-. If the terminal amino group is to be shown explicitly, the recommendations suggest placing the amino-acid symbol in quotation marks and explaining the convention, to make it clear that the symbol does not have its usual meaning of including the -NH- group, e.g.

$$Ac_2O + NH_2\text{-'Ala'-} \rightarrow AcO^- + H^+ + Ac\text{-NH-'Ala'-}.$$

### Mixtures of diastereoisomers

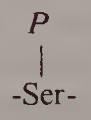
A mixture of Gly-Ala-Phe and Gly-D-Ala-Phe may be represented by the symbol Gly-*ambo*-Ala-Phe. Even if the mixture were prepared from DL-alanine, the symbol DL- should not be used for it, as it would be a racemate, and would not, except by chance, contain equal amounts of the two isomers. The prefix *ambo* (Latin, both) has previously been used for tocopherols [1].

### Peptide analogues

Analogues of peptides in which the -CO-NH- group is replaced by another group may be symbolized by prefixing the link that is not a true peptide bond by ψ (Greek psi), as in Ala-ψ($CH_2$-CO)-Ala for $NH_2$-CH($CH_3$)-$CH_2$-CO-CH($CH_3$)-COOH, an analogue of Ala-Ala.

### Substituted residues

Side-chain substitution has hitherto been represented by vertical lines, or, if a one-line representation is needed, by parentheses placed after a symbol, e.g.

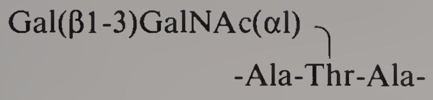


$\overset{P}{\overset{|}{\text{-Ser-}}}$ or -Ser ($P$)-

for a residue of $O^3$-phosphoserine (as -$P$ represents the phospho group, i.e. -$PO_3H_2$ and its ionized forms). The alternative is now given of placing the substituent in parentheses before the amino-acid symbol. This is necessary for oligosaccharide substituents, whose own symbolism [2] requires that the substituting glycosyl group should be on the right of the carbohydrate symbol. Thus the repeating unit of the antifreeze glycoproteins of some fishes may be represented by

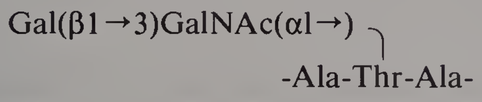
-Ala-(Galβ1-3GalNAcα1-)Thr-Ala-

as well as by



$$\begin{array}{l}\mathrm{Gal(\beta 1\text{-}3)GalNAc(\alpha l)}\ \urcorner \\ \qquad\qquad\qquad\quad \text{-Ala-Thr-Ala-}\end{array}$$

in the condensed form, and by



$$\begin{array}{l}\mathrm{Gal(\beta 1\rightarrow 3)GalNAc(\alpha l\rightarrow)}\ \urcorner \\ \qquad\qquad\qquad\qquad\quad \text{-Ala-Thr-Ala-}\end{array}$$

in the extended form [2].

**Glx**

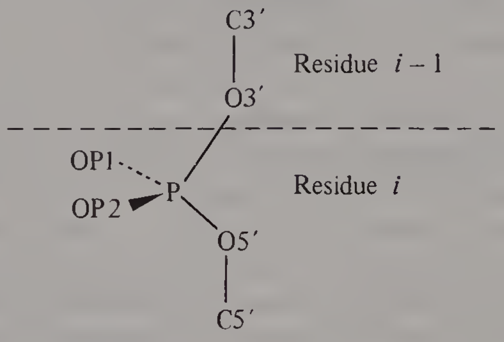
The symbol G1x has in the past symbolized either glutamic acid or glutamine. In practice it has been most convenient to apply it to any residue that yields glutamic acid on acid hydrolysis. This usage is now recognized, so that the symbol G1x also refers to 5-oxoproline (the cyclized derivative of glutamic acid often referred to as pyroglutamic acid), G1p, found as the N-terminal residue of many proteins, and to 4-carboxyglutamic acid, G1a, found in prothrombin.

**Enkephalins**

The word enkephalin is taken to mean any peptide that has the sequence Tyr-Gly-Gly-Phe-Xaa. Hence [Leu$^5$]enkephalin, which may often be written as [Leu]enkephalin, designates one of the natural peptides. It is important to use square brackets, the symbols for substitution, and not a hyphen, which would indicate N-terminal extension, i.e. Leu-enkephalin would be Leu-Tyr-Gly-Gly-Phe-Xaa.

## Atom numbering in polynucleotides

The recommendations for describing the conformations of polynucleotide chains [3] gave designations for all polynucleotide atoms except for the two otherwise non-bonded atoms on phosphorous. We recommend that the *pro-S* atom should be designated OP1 and the *pro-R* atom OP2, as follows:



In determining which atom is *pro-R* and which is *pro-S* one should note that C3 ′, which is bonded to two C atoms and one H, always takes precedence over C5 ′, which is bonded to one C atom and two H.

## REFERENCES

1. IUPAC-IUB Joint Commission on Biochemical Nomenclature (JCBN), Nomenclature of Tocopherols and Related Compounds, Recommendations 1981, *Eur. J. Biochem.* **123**, 473-475 (1982); *Pure Appl. Chem.* **54**, 1508-1510 (1982); *Arch. Biochem. Biophys.* **218**, 347-348 (1982); *Mol. Cell. Biochem.* **49**, 183-205 (1982).
2. IUPAC-IUB Joint Commission on Biochemical Nomenclature (JCBN), Abbreviated Terminology of Oligosaccharide Chains, Recommendations 1980, *J. Biol. Chem.* **257**, 3347-3351 (1982); *Eur. J. Biochem.* **126**, 433-437 (1982); *Pure Appl. Chem.* **54**, 1517-1522 (1982); *Arch. Biochem. Biophys.* **220**, 325-329 (1983).
3. IUPAC-IUB Joint Commission on Biochemical Nomenclature (JCBN), Abbreviations and Symbols for the Description of the Conformations of Polynucleotide Chains, Recommendations 1982, *Eur. J. Biochem.* **131**, 9-15 (1983); *Pure Appl. Chem.* **55**, 1273-1280 (1983).

---

# CNC-IUPAC Awards

The establishment of the CNC-IUPAC Awards by the Canadian National Committee of IUPAC was recorded in CI, 1983, No. 3, p. 29. We are told that the 1984 winners are Dr. David Griller of the National Research Council who will give a paper at the 7th IUPAC Conference on Physical Organic Chemistry, Auckland, New Zealand and Prof. Hsing-Jang Lin of the University of Alberta who will present a paper at the 14th International Symposium on the Chemistry of Natural Products, Poznań, Poland.

---

# Composites: Materials and Engineering

An international symposium with the above title is to be held at the University of Delaware, Newark, Delaware, USA, 24–28 September 1984. Further information can be obtained from CCM Symposium Committee, Center for Composite Materials, Spencer Laboratory, University of Delaware, Newark, Delaware 19711, USA.

# IUPAC-SPONSORED CONFERENCES

Information on the Conferences to be held during late August and early September 1984 is, unfortunately, very variable — for a few, recently-approved conferences, non-existent. However, as some of the registration dates are extremely close, even if this issue of CI appears in good time, to the distribution date, we are publishing what we've got. It may be possible to update next time. Remember that more information on these Conferences, and the necessary registration forms, may be obtained from the organizers listed on pp. 35–37.

## 7th IUPAC Conference on Physical Organic Chemistry, Auckland, New Zealand, 20–24 August 1984

The Conference, with the theme 'Intermediates and Transition States in Organic Reactions', will be held at the University of Auckland. It will follow the general format of previous Conferences, with plenary lectures, sessions of five or six research papers following a session lecture, and poster sessions. The official language of the Conference will be English.

*Plenary lectures* to be given are:

Reaction mechanisms of organic ions in the gas phase (J. I. Brauman, USA).

On the use of a good termination reagent to initiate radical chain reactions (J. F. Bunnett, USA).

Hyperconjugation: Intermediates and transition states in replacements and eliminations (P. B. D. de la Mare, New Zealand).

Disubstituted carbenium ions (vinyl cations and phenyl cations) as reactive intermediates (M. Hanack, FRG).

Kinetic studies of some free radical reactions K. U. Ingold, Canada).

*Title not yet known* (Sir George Porter, UK).

A theoretical approach to gas-phase ion chemistry (L. Radom, Australia).

Some quantitative effects of strain on reactivity (C. J. M. Stirling, UK).

**Auckland city and harbour. The University is the block of buildings slightly right of centre, with the Chemistry Department arrowed.** *(Photo courtesy of Godfrey Boehnke.)*

*Session lectures* are to be given by K.-D. Asmus (Berlin), E. Baciocchi (Italy), A. L. J. Beckwith (Australia), J. M. Coxon (New Zealand), E. M. Kosower (Israel), A. J. Kresge (Canada), F. M. Menger (USA), J. Miller (Brazil), K. Mislow (USA), Y. Murakami (Japan), P. C. Myhre (USA), C. Reichardt (FRG), H. J. Shine (USA) and possibly also R. G. Bergman and A. Streitwieser, both of USA.

The registration fee, if paid by 31 May 1984, is NZ$180 and NZ$200 after that date. No registration can be accepted after 30 June 1984. A wide range of accommodation, ranging from student accommodation units to a de luxe international hotel, is available within easy walking distance of the Conference venue. If you do intend to do some walking, do not forget to take a raincoat with you — and some warm clothing, as the Auckland weather at the time of the Conference can be very variable with daytime temperatures of anything between 10 and 18°C, possibly falling to as low as 5°C at night.

Auckland is now almost 150 years old and the Greater Auckland area — stretching some 40 miles from north to south — has a population of nearly one million. The University of Auckland celebrated its Centenary last year and chemistry was one of the subjects taught from its foundation, by Prof. Frederick D. Brown (1851–1922), a London graduate and, from 1880 until his departure for New Zealand, a Demonstrator in chemistry under Prof. Odling at the University Museum, Oxford. The Head of Department from 1968 to 1980 was Prof. P. D. B. de la Mare who is Chairman of the Conference.

## **1st International Symposium on Solubility Phenomena,** London, Ontario, Canada, 21–23 August 1984

The scientific meetings of the Symposium will be held at the University of Western Ontario, London, Ontario, Canada. London is situated in southwestern Ontario about midway between Toronto and Detroit.

Accommodation available includes university student residences as well as various categories of hotel.

The programme will include seven plenary lectures, about 40 submitted papers and a poster session. The official language will be English although scientific communications may be given in either English or French — but with no simultaneous translation. Subjects that it is expected will be covered include:

Links between thermochemistry and solubility of solids;
Methods of critical evaluation of data;
New solubility data of broad theoretical interest;
Theories of solubility;
Correlations of solubility data;
Solubility phenomena in polymer systems;
Applications of solubility data.

*Plenary lectures* to be given are:

Theoretical aids to critical evaluation of solubility data (R. Cohen-Adad, France).
Salting-out phenomena (B. E. Conway, Canada).
Theories on solubilities of non-electrolytes (S. Goldman, Canada).
Solubilities and geochemistry (I. L. Khodakovsky, USSR).
Aqueous–inorganic phase equilibria at high temperatures (W. L. Marshall, USA).
Solubilities of gases (E. Wilhelm, Austria).
Polymer solubilities (B. A. Wolf, FRG).

## **5th International Conference on Organic Synthesis,** Freiburg i. Br., FRG, 27–30 August 1984

The Conference will be held in the Chemisches Laboratorium of the University of Freiburg. The scientific programme will include plenary lectures, invited lectures and posters on the following four general topics:

Modern methodology in organic synthesis;
Transition metals in organic synthesis;
Enzymatic processes in organic synthesis;
Carbohydrates in organic synthesis.

The language of the Conference, written and spoken, will be English. The registration fee is DM 200.

## **7th International Symposium on Carotenoids,** Munich, FRG, 27–31 August 1984

The Symposium will be held in the Botanical Institute of the University of Munich. The scientific programme will include main lectures, research reports and contributed papers (given orally or as posters). The official language will be English.

The *main lectures* are grouped under seven general headings —

*Structure and stereochemistry*

Carotenoid structures, old and new problems (C. H. Eugster, Switzerland).
Carotenoids of lower plants: Recent progress (S. Liaaen-Jensen, Norway).
New structures of carotenoids in marine animals (T. Matsuno, Japan).

*Analytical methods*

NMR of carotenoids. New experimental techniques (G. Englert, Switzerland).
Laser Raman spectroscopy of carotenoids (J. C. Merlin, France).
HPLC, a powerful tool in carotenoid research (P. Rüedi, Switzerland).

*Chemical synthesis*

Advances in the synthesis of optically active carotenoids (H. Pfander, Switzerland).

Synthesis advances in the carotenoid field (E. Widmer, Switzerland).

The synthesis of $^{13}C$-labelled retinals and their application in bacteriorhodopsin and rhodopsin research (J. Lugtenburg, Netherlands).

*Carotenoids in medicine*

Retinoids: an overview of some natural carotenoid metabolites and their synthetic analogues (F.-F. Frickel, FRG).

Carotenoids and cancer-epidemiological surveys and experimental animal studies (M. Mathews-Roth, USA).

*Biosynthesis and metabolism*

Carotenogenic enzymes from different organisms (U. Mitzka-Schnabel, FRG: P. Bramley, UK: B. Camara, France; P. Beyer, FRG).

Carotenoid metabolism in animals: A biochemist's view (B. H. Davies, UK).

Absorption, retention and metabolic transformation of carotenoids in rainbow trout, salmon and hens (K. Schiedt, Switzerland).

Catabolism of carotenoids (C. R. Enzell, Sweden).

Stable isotopes in carotenoid biochemistry (G. Britton, UK).

*Functions of carotenoids in plants*

Carotenoids in photosynthesis (R. Cogdell, UK).

Chromoplasts, carotenoid-bearing organelles (K. Kleinig, FRG).

Carotenoids in plant photoprotection (E. L. Schrott, FRG).

*Special lectures*

Recent advances in stereoselective carbon–carbon double bond formation (M. Julia, France).

The retinal proteins of Halobacteria: From photosynthesis to phototaxis (D. Oesterhelt, FRG).

Visual pigments (K. Nakanishi, USA).

Photoregulation of carotenoid biosynthesis (W. Rau, FRG).

The registration fee, if paid before 31 May 1984, is DM 180 but after that date it goes up to DM 220. There is plenty to do and see in Munich if you have time. Besides many old churches and historical buildings in the city centre there are about twenty museums and collections, among them four picture galleries, two museums of ancient Greek art, two museums of Bavarian history and folk art and the famous technical museum (the Deutsches Museum). In addition, some historical palaces, two opera houses, many theatres, a well-known zoo and, of course, the botanical garden surrounding the Institute may be of interest. However, be warned! The weather in Munich at the end of August is unpredictable. It may be dry and sunny — or wet. The daytime temperature may be anything from 15 to 30°C, dropping to between 10 and 20°C in the evening.

---

## **8th International Symposium on Medicinal Chemistry,** Uppsala, Sweden, 27–31 August 1984

The Inaugural Lecture, by Prof. Bengt Samuelsson, will be delivered in the lecture hall of the University of Uppsala. All the sub-symposia and poster sessions will take place at the Biomedical Centre situated 2 km from the city centre. These sub-symposia are organized in groups of three in morning or afternoon sessions and have the following topical titles:

Medicinal chemistry based on immunology; Adrenergic agonists and antagonists; Analgetics.

Antiviral agents; QSAR; Calcium antagonists.

Carbohydrates in medicinal chemistry; Dopamine receptor agonists and antagonists; Drug receptor interactions.

**Biomedical Centre, Uppsala. Main entrance with the DNA sculpture in the centre**

- Antibacterial agents; Serotonin receptor agonists and antagonists; Histaminergic agonists and antagonists.
- Mycotoxines; GABA and benzodiazepines; Enzyme inhibitors.
- Cancer chemotherapy; Cholinergic agonists and antagonists; Neuropeptides.

The official language of the Symposium will be English. The Symposium fee is SEK 1100 if received before 31 May 1984 and SEK 1500 after this date. The average daytime temperature at the end of August is of the order of 15–20°C and a raincoat or umbrella (or both for the pessimists) is recommended.

---

## 10th International Symposium on the Reactivity of Solids, Dijon, France, 27 August–1 September

This Symposium will follow the tradition of the series and deal with chemical reactions involving mineral and organic solids in their different crystallized and amorphous states, in solid–gas, solid–solid and solid–liquid systems. Results concerning relations between the reactivity of solids and processes dealing with the formation and movement of defects (point defects, dislocations, extended defects, outer and inner surfaces, grain boundaries, etc.) as well as with adsorbed chemical species and impurities fit well into its scope.

---

## 9th International Conference on Raman Spectroscopy, Tokyo, Japan, 27 August–1 September 1984

The Conference will be held at Sophia University, a Roman Catholic university located in the central part of Tokyo. Subjects expected to be covered include: Theoretical and mechanistic studies on Raman processes; Instrumental innovations; Analytical applications; Biological and medical applications; Elementary excitations in solids; Structural studies and vibrational analysis; Technological and industrial applications; Application to the studies of amorphous and low-dimensional materials; Application to polymer studies; Dynamics in liquids and solids; High-resolution Raman spectroscopy; Intensities and band shapes; Low-frequency Raman and Brillouin scattering; Nonlinear Raman and multi-photon spectroscopy; Raman optical activity; Resonance Raman scattering; Surface and interfacial phenomena; Time-resolved and transient spectroscopy; Related fields and novel applications.

The scientific programme will consist of invited review papers, invited research reports, contributed papers and discussion meetings. The *invited review papers* (45 min) will be:

- Raman scattering in semiconductors: Recent developments (M. Cardona, FRG).
- Time-resolved resonance Raman techniques of phototransients of life-times in the milli- to picosecond timescale (M. El-Sayed, USA).
- Experimental studies of picosecond processes using coherent and spontaneous Raman scattering (R. M. Hochstrasser, USA).
- Optical response of a randomly modulated atom (R. Kubo, Japan).

The ten *discussion meetings* will each have an international, i.e. not Japanese, leader and a Japanese scientist in support. The titles of these meetings (with names of the respective leaders) are:

- Additional boundary conditions (D. L. Mills, USA).
- Time evolution formalism for resonant secondary radiation (A. C. Albrecht, USA).
- Time-resolved Raman spectroscopy (J. A. Koningstein, Canada).
- Nonlinear Raman spectroscopy (W. Kiefer, FRG).
- Combustion and plasma diagnostics by Raman, CARS, and related techniques (J. P. Taran, France).
- Characterization of semiconductors (L. Ushioda, USA).
- Vibrations of macromolecules (S. Krimm, USA).
- Resonance Raman spectra of heme proteins (T. G. Spiro, USA).
- Medical application of Raman spectroscopy (N. T. Yu, USA).
- Surface and interfacial phenomena (E. Burstein, USA).

The official language of the Conference will be English. The registration fee, if paid before 19 May 1984, is ¥30 000 but increases to ¥35 000 after that date.

---

## International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences, Ghent, Belgium, 3–6 September 1984

The scientific programme will be held in the Farmaceutisch Institut of the State University of Ghent. It will comprise five plenary lectures and oral or poster contributed papers, the Symposium language being English. Topics to be covered include: drug and bioanalysis via fluorescence and phosphorescence (LTP, RTP, micellar); fluorescence and chemiluminescence immunoassays; detection techniques in chromatography (fluorescence, RTPL); solid surface luminescence methods; chemical derivitization methods; luminescence applications and drug metabolism, clinical chemistry, biochemistry, pharmacokinetics, toxicology, ecology, protein tagging.

Registration before 28 July 1984 will cost 5000 BF or 6000 BF thereafter. Further details and a brief history of the State University of Ghent will appear in the next issue of CI.

Faculty of Pharmaceutical Sciences, University of Ghent

---

## 7th International Symposium on Organosilicon Chemistry, Kyoto, Japan, 9–14 September 1984

The scientific sessions of the Symposium will be held in the Kyoto International Conference Hall, about 5 km from Kyoto proper. They will include plenary and invited session lectures as well as contributed papers, as either oral or poster presentations. These contributed papers are expected to cover the following fields of organosilicon chemistry: Synthesis and reactivity; Structure and bonding; Photochemistry; Silicon reactive intermediates; Hypervalent silicon compounds; Silicon in organic synthesis; Industrial applications; Silanes and polysilanes; Environmental aspects and bioorganosilicon chemistry.

The *plenary lectures* to be given are:

Further studies on stable silaethylenes (silenes) (A. G. Brook, Canada).

Stereochemical control in organic synthesis using silicon (I. Fleming, UK).

Divalent and multiply bonded silicon compounds (R. West, USA).

*Invited session lectures* will include:

Chemistry of some polyorganosilicon precursors to ceramics (R. H. Baney, USA).

Short-lived organosilicon molecules and molecular ions (H. Bock, FRG).

New results concerning the transition metal chemistry of silicon (R. Corriu, France).

Some insights into the chemistry of organosilicon intermediates from gas kinetic studies (I. M. T. Davidson, UK).

New di- and polysilylated substrates (J. Dunoguès, France).

Kyoto International Conference Hall

Highly sterically hindered organosilicon compounds (C. Eaborn, UK).

Mechanistic studies of silicon atom and silylenes (P. Gaspar, USA).

Chemistry of unstable intermediates derived from reactions of organohalosilanes with alkali metals vapour (L. E. Gusel'nikov, USSR).

Syntheses and catalytic actions of some organosilicon polymer-supported metal complexes (Y.-Y. Jiang, China).

The reaction mechanism of difluorosilylene (C.-S. Liu, China).

The structure–reactivity correlations in hetarylsilanes (E. Lukevics, USSR).

Silicon–cobalt reagents in synthesis (P. Magnus, USA).

Catalysis of hydrosilylation and metathesis of vinyl-substituted silanes (B. Marciniec, Poland).

Organosilicon and related organo-nonmetallic species: Ligand effects on stereochemistry and reactivity (J. C. Martin, USA).

Molecular orbital studies of structure and reactivity of organosilicon compounds (K. Morokuma, Japan).

New aspects of silacycloheptatriene chemistry (Y. Nakadaira, Japan).

Selectivity in organosilicon-mediated reactions: Origin and application (R. Noyori, Japan).

Group transfer polymerization: A new concept for addition polymerization with organosilicon initiators (D. Y. Sogah, USA).

Silafunctional compounds in organic synthesis (K. Tamao, Japan).

$SiH_4$ plasma-diagnosis and film deposition (K. Tanaka, Japan).

Current trends of silicone industry in Japan (T. Wada, Japan).

Sila-perfumes (U. Wannagat, FRG).

Chemistry of small ring polysilanes (H. Watanabe, Japan).

Recent results in chemistry of unsaturated silicon compounds: $>Si=C<$, $>Si=N\diagup$, $>Si=O$ (N. Wiberg, FRG).

The official language of the Symposium is English. Registration fees are — ¥25 000, before 31 May 1984 and ¥ 30 000 thereafter. The weather in Kyoto in September is hot and humid. Temperatures usually range from 25 to 29°C with a relative humidity of about 75%.

# OTHER PEOPLE'S PUBLICATIONS

## ICSU Committee on Data for Science and Technology (CODATA)

**CODATA Newsletter No. 27, January 1984.** Announcement of a Symposium on Critical Evaluation and Prediction of Phase Equilibrium in Multicomponent Systems, Poland, May 1984. Links between IUNS and CODATA. Notes on: AGARD lectures on numerical and factual data bases; Toxicology Data Bank; International Sulphur Unit; IOCD; IUPAC computerized data base committee; The Atomic Data Bank.

## International Union of Food Science and Technology (IUFoST)

**IUFoST Newsletter, New Series, No. 9, December 1983.** Notes on 6th World Congress of Food Science and Technology, Dublin, September 1983, also of the 4th IUFoST General Assembly. Summary of a report entitled "The Food-Fuel Equation". List of proceedings of symposia and congresses, with publishers and prices.

### The Food-Fuel Equation

Dr. C. Trägardh has completed a report with the above title after a study of the production of liquid fuels from agricultural crops and an assessment of the effects of such processes on food production and availability, and on the environment. The project was supported by the IUFoST Working Party on Energy in Food Systems and the report may be obtained from the Division of Food Engineering, Lund University, PO Box 50, S–23053 Alnarp, Sweden.

## International Union of Nutritional Sciences (IUNS)

**IUNS Newsletter No. 10, October 1983.** Notes on 13th International Congress of Nutrition, 19–25 August 1985. List of IUNS publications issued since March 1983. Reports on Conferences May 1982 to September 1983. IUNS cooperation with ICSU bodies and UN agencies. Report on CHEMRAWN II.

## International Union of Pure and Applied Biophysics (IUPAB)

**IUPAB News, January 1984.** Calendar of meetings 1984. Minutes of the meeting of the IUPAB Executive Committee, January 1984, including notes on IUPAB representation in IUPAC Macromolecular Division and IUB–IUPAB–IUPAC Commission on Biothermodynamics.

## International Union of Pure and Applied Physics (IUPAP)

**IUPAP News Bulletin NB 84-1, January 1984.** Report on items dealt with by the IUPAP Executive Council in Ottawa, September 1983.

**IUPAP News Bulletin NB 83-4, December 1983.** List of published proceedings of IUPAP conferences with details of publisher, cost and how to order.

## European Federation of Biotechnology (EFB)

### Biotechnology in Europe

A report with the above title has been published by DECHEMA on behalf of EFB. It was prepared following two 'workshops' held in Oberursel, FRG, in 1981 and 1982, and consideration of reports by leading European biotechnologists on 'the state of the art'. The report is in three sections:

- I — outlines a programme of action and provides a synopsis of the report;
- II — 'state of the art' presentations, in two parts —
  - a. Disciplines and methods
  - b. Products and services;
- III — a detailed consideration of the political, economic and social aspects involved.

The 201-page report costs DM30 and can be obtained from DECHEMA, Postfach 97 01 46, D-6000 Frankfurt am Main 97, Federal Republic of Germany.

# IUPAC PEOPLE

### Congratulations to:

**Prof. G. H. Nancollas** (Vice-President Division V) on being presented with the 1984 Biological Mineralization Award at the opening session of the International Association for Dental Research.

**Dr. H. J. White** (Commission I.2, Subcommittee on Thermodynamic Tables) on winning a Thermal Conductivity Award at the International Thermal Conductivity Conference.

**We regret to record the death of:**

**Dr. C. W. Beckett,** USA (3 February 1983) — Subcommittee on Plasma Chemistry (1969–1979), Commission on Thermodynamics (1973–1977).

# RECENT REPORTS

## Physicochemical quantities and units in clinical chemistry with special emphasis on activities and activity coefficients *(Recommendations 1983)*

The *provisional* recommendations (PAC, Vol. 53, pp. 1605–1643 (1981), see also CI, 1981, No. 5, p. 27) have been revised on the basis of many comments from various IUPAC Commissions, individual scientists, and industry.

The symbols of quantities have been modified to conform with the IUPAC *Manual of symbols and terminology for physicochemical quantities and units* and its Appendices [PAC, Vol. 37, pp. 503–516 (1974), Vol. 51, pp. 1–41 (1979), Vol. 54, pp. 1239–1250 (1982)]. This means that the component is printed as a subscript, e.g. $p_{CO_2}$, $p_{O_2}$, whereas, in clinical chemistry the component is often printed on the line, e.g. $p\mathrm{CO_2}$, $p\mathrm{O_2}$.

"Too comprehensive" was one of the comments, but, although now condensed from 38 to 28 pages, the document still contains a comprehensive list of definitions of different quantities related to activities and activity coefficients and also a list of typical values for normal human plasma, referring to the components $H^+$, $Na^+$, $Ca^{2+}$, $HCO_3^-$, $CO_2$, $O_2$, and $H_2O$.

These lists are urgently needed in clinical chemistry where ion-selective electrodes are rapidly becoming routine equipment in all laboratories. The electrodes respond to changes in activity, which is presumably also the most relevant quantity from a biological point of view. However, traditionally the results are expressed in terms of amount-of-substance concentration. A thorough understanding of the physicochemical definitions of absolute and relative activity, and rational, molal, and concentrational activity coefficients is necessary in order to appreciate the advantage of measuring activities and to understand the possible sources of bias when the results are converted to molality or amount-of-substance concentration.

These recommendations were prepared by O. Siggaard-Andersen, R. A. Durst and A. H. J. Maas for Commission VII.2 and published in PAC, Vol. 56, pp. 567–594 (1984).

## Nomenclature and symbolism for amino acids and peptides *(Recommendations 1983)*

These recommendations combine and extend four separate sets of earlier recommendations, on α-amino-acid and peptide nomenclature, on symbolizing peptides by both the 3-letter and 1-letter residue designations, and on designating derivatives of those peptides that possess names. The trivial names of common amino acids are listed, and principles for modifying these names to designate derivatives and peptides are described. The sections on stereochemistry and ionized forms of the recommendation on amino-acid nomenclature are expanded, using the *RS* system to designate chiral centres in the side chain, and using the prefix *ambo* in specifying mixtures of diastereoisomeric peptides. Some new symbols are introduced in the section on representing residues with 3-letter symbols, and recommendations for designating ionized forms of peptides are given. Modifications of named peptides that can be designated now include their enantiomers and peptides of reversed sequence.

This report, prepared by the Joint Commission on Biochemical Nomenclature, was published in PAC, Vol. 56, pp. 595–624 (1984).

## Molecular characterization of ethylene-propylene block copolymers

In order to improve polypropylene impact strength at low temperature a process of propylene copolymerization with ethylene is industrially used. Through a proper programme of interlaboratory tests, the best method for the isolation of the copolymeric fraction and the homogeneity of the molecular characterization data were investigated.

Determination of xylene soluble and insoluble fractions and subsequent structural characterization proved to be a reliable investigation method, both qualitatively and quantitatively. Fractionation by heat extraction with heptane on films and subsequent cold separation of the soluble part gave less reproducible results: in addition, partially isotactic homopolymeric fractions, separated with difficulty in the cold, are extracted.

Results of intrinsic viscosity are reproducible by interlaboratory measurements; NMR data of wt % $C_2$ also gave reliable results, but the corresponding IR results were not good. (This technique must be applied only to routine analysis on homogeneous sets of samples).

Values obtainable by DSC are comparable enough, provided homogeneous heating and cooling conditions are respected. Homogeneity of GPC values is sufficient, obviously under the same calibration conditions. On the contrary, light scattering values always differ considerably, confirmation of the extreme delicacy of this method.

This report was prepared by the Working Party on Molecular Characterization of Commercial Polymers of Commission IV.2 and was published in PAC, Vol. 56, pp. 625–634 (1984).

## Diffusion coefficients of metals in mercury

In the introductory part, methods used in the determination of diffusion coefficients of metals in mercury are briefly discussed. The discussion is limited to electroanalytical techniques, since these methods were used in preference to others in the determinations. The advantages of the chronoamperometric procedure are presented. In the second part, values for the diffusion coefficients of various metals in mercury, reported in literature, are given, together with additional information. These values refer mostly to 25°C, but some values measured at other temperatures are also reported.

For some metals, where discrepancies between various experimental results are large, ‘‘recommended values’’ are given. These recommended values were used for the construction of the dependence of diffusion coefficients on metal atom radius. In this plot, the results for many metals are grouped along a single line, in agreement with the Stokes-Einstein equation. Deviation observed from this line for alkali, alkali earth and some lanthanide metals suggests that the atoms of these metals are solvated by mercury.

This report, prepared for Commission V.5, was published in PAC, Vol. 56, pp. 635–644 (1984).

## Critical evaluation of analytical methods for the determination of trace elements in various matrices: Part I — Determination of selenium in biological materials and water

Selenium has both beneficial and toxic effects on living organisms. Thus it is important to be able to determine selenium accurately and precisely at trace and ultratrace levels. This paper discusses the most widely used procedures for selenium determination in biological materials and water. Molecular fluorescence, and atomic absorption spectrometry after hydride generation are considered in detail. The review identifies the problems and sources of error, and indicates the range of applicability.

This report was prepared by Commission V.2 and was published in PAC, Vol. 56, pp. 645–651 (1984).

## Atomic weights of the elements 1983

The biennial review of atomic weights, $A_r(E)$, determinations and other cognate data have resulted in the following changes in recommended values (1981 values in parentheses): Helium 4.002602 ± 2 (4.00260 ± 1); Lithium 6.941 ± 2 (6.941 ± 3); Boron 10.811 ± 5 (10.81 ± 1); Sulfur 32.066 ± 6 (32.06 ± 1); Calcium 40.078 ± 4 (40.08 ± 1); Scandium 44.95591 ± 1 (44.9559 ± 1); Chromium 51.9961 ± 6 (51.996 ± 1); Zinc 65.39 ± 2 (65.38 ± 1); Gallium 69.723 ± 4 (69.72 ± 1); Zirconium 91.224 ± 2 (91.22 ± 1); Ruthenium 101.07 ± 2 (101.07 ± 3); Tin 118.710 ± 7 (118.69 ± 3). These values are incorporated in the Table of Standard Atomic Weights of the Elements 1983. The Table lists estimated uncertainties between ± 1 and ±9 in the last tabulated figure, which represents a departure from the practice in prior years of restricting uncertainties to two alternative values, either ±1 or ±3. Annotations in Tables 1 and 2 have been changed for several of the elements and element 107 is included in the table of Relative Atomic Masses and Half-Lives of Selected Radionuclides for the first time. The Report summarizes those elements of non-terrestrial origin for which variations in isotopic composition have been found and categorizes them by their cause from mass fractionation, nuclear reactions or solar wind.

This report by Commission II.1 was published in PAC, Vol. 56, pp. 653–674 (1984).

## Isotopic compositions of the elements 1983

The Commission's biennial review of isotopic compositions as determined by mass spectrometry and other relevant methods has been undertaken by the Subcommittee for the Assessment of Isotopic Composition (SAIC). The Subcommittee's critical evaluation of the published literature element by element forms the basis of the Table of Isotopic Compositions as Determined by Mass Spectrometry, 1983, which is presented in this Report. Atomic Weights calculated from the tabulated isotopic abundances are consistent with $A_r$(E) values listed in the Table of Standard Atomic Weights 1983.

This report by Commission II.1 was published in PAC, Vol. 56, pp. 675–694 (1984).

## Element by element review of their atomic weights

Since its inception in 1919, IUPAC has accepted responsibility for the evaluation and dissemination of the best current knowledge of the atomic weights of the chemical elements. This task is delegated to the IUPAC Commission on Atomic Weights and Isotopic Abundances (Commission II.1). Its members review and assess the reliability of relevant published data, taking account of the estimated experimental uncertainties and the natural variabilities. The Commission publishes biennial reports prepared in conjunction with every IUPAC General Assembly. At that time revised tables, now called Tables of Standard Atomic Weights, are published. They refer to our best knowledge of the elements in natural sources and receive world-wide recognition for use in science, technology and commerce.

When newly evaluated information from the scientific literature provides cogent reason for a change in a standard atomic weight or its implied range, the Commission decides upon, publishes and explains such a change in its report.

At infrequent intervals it becomes desirable to present the status and recent history of all atomic-weight values in one document. This review, published in PAC, is such a document, with a brief section on every element that has a natural terrestrial composition.

Although the reliability and accuracy of atomic weights have much improved since 1961, the year of the last similar review, written just after the adoption of the carbon-12 scale for atomic weights, many of these values unfortunately still add significantly to the uncertainties of, for instance, some good analytical determinations and of value estimates of materials in trade. The account in the present review of elements such as titanium and germanium, with markedly uncertain atomic weights, may encourage chemists to turn their attention to their historic role in attaining outstanding experimentation for atomic-weight determinations.

This 1984 review differs from its predecessors in that it contains:

(1) more detailed discussions on atomic-weight variabilities and experimental uncertainties;
(2) special remarks on abnormal materials with highly anomalous atomic weights, such as those that have suffered isotopic fractionation;
(3) the description of current knowledge on the effects of radioactive nuclides on atomic weights, especially of their daughter elements;
(4) a treatment of the mononuclidic elements, the atomic weights of which are judged to be accurately known to about one part per million; and
(5) a summary of the techniques of atomic-weight determinations with discussion of their reliabilities and future potential.

This report was published in PAC, Vol. 56, pp. 695–768 (1984).

## Treatment of variable valence in organic nomenclature (λ-convention)

### *Recommendations, 1983*

The use of substitutive nomenclature to name compounds that contain hetero-atoms which can occur in two or more valence states requires a way to distinguish between these bonding states. A variety of methods have been used none of which has been completely satisfactory over a broad range of compounds.

These rules provide a single, general method for indicating nonstandard, classical valence states of formally neutral, nonradical skeletal atoms of parent compounds except for cyclic parent structures with cumulative double bonds in addition to the maximum number of noncumulative double bonds. The basic principles of this method were introduced briefly in Section D, as revised for publication in the 1979 edition of the *IUPAC Organic Nomenclature Rules* (Pergamon Press, 1979), and fully explained as provisional recommendations under the title *The designation of nonstandard classical valence bonding in organic nomenclature,* published in PAC, Vol. 54, pp. 217–227 (1982). This method is consistent with the fundamental principles of substitutive nomenclature and is directly applicable to naming organic derivatives of inorganic hydrides. It consists of a symbol, $\lambda^n$, where $n$ is the classical bonding number defined as the sum of the total number of classical valence bonds to adjacent skeletal atoms, if any, and the number of hydrogen atoms; the $\lambda^n$ symbol is attached to the locant, where needed, of the skeletal atom in the skeletal structure.

This report by Commission III.1 was published in PAC, Vol. 56, pp. 769–778 (1984).

# IUPAC CONFERENCES

Additional information from address in parentheses

## 1984

### LOW-DIMENSIONAL SYNTHETIC METALS

June 17–22. International Conference on the Physics and Chemistry of Low-dimensional Synthetic Metals. Abano Terme, Italy.
(Prof. G. Zerbi, Dipartimento di Chimica Industriale e Ingegneria Chimica, Politecnico di Milano, Piazza Leonardo da Vinci 32, I-20133 Milano, Italy.)

### SOURCES OF ORGANIC MATERIALS

June 25–29. Resource Material Conversion to meet Future Needs — (Bio-) Chemical Process Bridges, CHEMRAWN III. The Hague, The Netherlands.
(Congress Bureau, QLT Convention Services, Keizersgracht 792, 1017 EC Amsterdam, The Netherlands.)

### CARBOHYDRATES

July 1–7. 12th International Carbohydrates Symposium. Utrecht, Netherlands.
(Prof. J. F. G. Vliegenthart, c/o Secretariat XIIth International Carbohydrate Symposium, Department of Bio-Organic Chemistry, State University of Utrecht, P.O. Box 5055, NL-3502 JB Utrecht, Netherlands.)

### MODIFIED POLYMERS

July 2–5. 6th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia.
(Dr. A. Romanov, Director, Polymer Institute, Slovak Academy of Sciences, Dubravska Cesta, CS-842 36 Bratislava, Czechoslovakia.)

### CATALYSIS

July 2 - 6. 8th International Congress on Catalysis. Berlin, Federal Republic of Germany.
(DECHEMA, P.O. Box 970146, D-6000 Frankfurt am Main 97, Federal Republic of Germany.)

### MEDICAL POLYMERS

July 9–12. 26th Prague Microsymposium on Macromolecules: Polymers in Medicine and Biology. Prague, Czechoslovakia.
(26th Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 616, Czechoslovakia.)

### NATURAL PRODUCTS

July 9 - 14. 14th International Symposium on the Chemistry of Natural Products. Poznań, Poland.
(Prof. dr. Maciej Wiewiorowski, Institute of Bioorganic Chemistry, Polish Academy of Sciences, ul. Noskowskiego 12/14, 61-704 Poznań, Poland.)

### MACROMOLECULES

July 16–19. 27th Prague Microsymposium on Macromolecules: Physical Optics of Dynamic Phenomena and Processes in Macromolecular Systems. Prague, Czechoslovakia.
(27th Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 616, Czechoslovakia.)

### PHOTOCHEMISTRY

July 22–27, 10th IUPAC Symposium on Photochemistry. Interlaken, Switzerland.
(PD Dr. A. M. Braun, Institut de chimie physique, EPFL, Ecublens, CH-1015 Lausanne, Switzerland.)

### COORDINATION CHEMISTRY

July 29–August 3. 23rd International Conference on Coordination Chemistry. Boulder, CO, USA.
(Prof. Cortlandt Pierpont, Secretary 23rd International Conference on Coordination Chemistry, Campus Box 215, University of Colorado, Boulder, CO 80309, USA.)

### CHEMICAL THERMODYNAMICS

August 13–17. Conference on Chemical Thermodynamics. Hamilton, Canada.
(Dr. P. A. G. O'Hare, Argonne National Laboratory, Chemical Technology Division, 9700 South Cass Avenue, Argonne, IL 60439, USA.)

### NON-AQUEOUS SOLUTIONS

August 13–17. 9th International Conference on Nonaqueous Solutions. Pittsburgh, Pennsylvania, USA.
(Prof. J. F. Coetzee, Department of Chemistry, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA.)

### PHYSICAL ORGANIC CHEMISTRY

August 20–24. 7th IUPAC Conference on Physical Organic Chemistry. Aukland, New Zealand.
(Prof. B. R. Davis, Chemistry Department, University of Aukland, Private Bag, Aukland, New Zealand.)

### INSULATING CRYSTALS

August 20–24. International Conference on Defects in Insulating Crystals. Salt Lake City, Utah, USA.
(Prof. B. Henderson, Department of Pure and Applied Physics, Trinity College, University of Dublin, Dublin 2, Ireland.)

### SOLUBILITY PHENOMENA

August 21–23. 1st International Symposium on Solubility Phenomena. London, Ontario, Canada.
(Dr. M. Salomow, P.O. Box 254, Fair Haven, NJ 07703, USA.)

### COLLOIDS AND MACROMOLECULES

August 22–24. International Symposium on Physical Chemistry of Colloids and Macromolecules. Uppsala, Sweden.
(Prof. B. Ranby, Department of Polymer Technology, Royal Institute of Technology, S-100 44 Stockholm, Sweden.)

### ORGANIC SYNTHESIS

August 27–30. 5th International Conference on Organic Synthesis. Freiburg i. Br., FRG.
(Prof. H. Prinzbach, Chemisches Laboratorium, Universität Freiburg, Albertstrasse 21, D-7800 Freiburg i. Br., FRG.)

### CAROTENOIDS

August 27–31. 7th International Symposium on Carotenoids. Munich, FRG.
(Prof. W. Rau, Botanisches Institut der Universität München, Menzinger Strasse 67, D-8000 München 19, Federal Republic of Germany.)

### SOLID FILMS AND SURFACES

August 27–31. 3rd International Conference on Solid Films and Surfaces. Sydney, Australia.
(Prof. D. Haneman, School of Physics, University of New South Wales, P.O. Box 1, Kensington, N.S.W. 2033, Australia.)

### MEDICINAL CHEMISTRY

August 27–31. 8th International Symposium on Medicinal Chemistry. Uppsala, Sweden.
(8th International Symposium on Medicinal Chemistry, The Swedish Academy of Pharmaceutical Sciences, P.O. Box 1136, S-111 81 Stockholm, Sweden.)

### RAMAN SPECTROSCOPY

August 27–September 1. 9th International Conference on Raman Spectroscopy. Tokyo, Japan.
(Prof. Mitsuo Tasumi, Department of Chemistry, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

### REACTIVITY OF SOLIDS

August 27–September 1. 10th International Symposium on the Reactivity of Solids. Dijon, France.
(10e ISRS, Secrétariat Exécutif, Laboratoire de Réactivité des Solides, Faculté des Sciences Mirande, B.P. 138, F-21004 Dijon Cédex, France.)

### LUMINESCENCE SPECTROMETRY

September 3–6. International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr. W. R. G. Baeyens, Fakulteit van de Farmaceutische Wetenschappen, Laboratoria voor Farmaceutische Chemie en Ontleding van Geneesmiddeln, Harelbekestraat 72, B-9000 Gent, Belgium.)

### NICKEL METABOLISM AND TOXICOLOGY

September 4–7. 3rd International Conference on Nickel Metabolism and Toxicology. Paris, France.
(M. C. Bozec, Société Metallurgique Le Nickel-SLN, Tour Maine Montparnasse, 33 avenue du Maine, F-75751 Paris Cédex 15, France.)

### ORGANOSILICON CHEMISTRY

September 9–14. 7th International Symposium on Organosilicon Chemistry. Kyoto, Japan.
(Prof. M. Kumada, Chairman of VIIth ISOS, The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

### POLYMER CHEMISTRY

September 26–28. Polymer Chemistry Meeting. Leuven, Belgium.
(Dr. H. Vankerckhoven, Laboratorium voor Macromoleculaire en Organische Scheikunde, K.U. Leuven, Celestijnenlaan 200F, B-3030 Leuven (Heverlee), Belgium.)

### AUTOMATION

October 15–18. 2nd International Congress on Automation in the Clinical Laboratory. Barcelona, Spain.
(The Secretary of the Second Congress, Dr. R. Galimay, Apartado de Correos 543, Barcelona, Spain.)

### COLLABORATIVE CHEMICAL ANALYSIS

October 25–27. 2nd International Symposium on the Harmonization of Collaborative Analytical Studies. Washington, DC, USA.
(Dr. H. Egan, Laboratory of the Government Chemist, Cornwall House, Stamford Street, London SE1 9NQ, UK.)

## 1985

### POLYMER ANALYSIS

February 11–14. POLYMER 85: Characterization and Analysis of Polymers. Melbourne, Australia.
(Dr. J. H. O'Donnell, Polymer & Radiation Group, Department of Chemistry, University of Queensland, Brisbane 4067, Australia.)

### ANALYTICAL CHEMISTRY

April 15–19. 2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Pretoria, RSA.
(Dr. A. Strasheim, Department of Chemistry, University of Pretoria, Pretoria 0002, Republic of South Africa).

### NONCRYSTALLINE ORDER IN POLYMERS

May 27–30. International Symposium on Noncrystalline Order in Polymers. Naples, Italy.
(Prof. P. Corradini, Dipartimento di Napoli, Universita di Napoli, Via Mezzocannone 4, I–80134 Napoli, Italy.)

### POLYMER COMPOSITES

July 8–11. 28th Microsymposium on Macromolecules: Polymer Composites. Prague, Czechoslovakia.
(Dr. P. Cefelin, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 1888 Petriny, Prague 6, Czechoslovakia.)

### ORGANOMETALLIC CHEMISTRY

July 12–15. 3rd International Symposium on Organometallic Chemistry directed toward Organic Synthesis. Kyoto, Japan.
(Prof. H. Nozaki, Department of Industrial Chemistry, Kyoto University (Kogaku-Bu), Yoshida, Kyoto, 606 Japan.)

### AROMATIC COMPOUNDS

July 15–19. 5th International Symposium on Novel Aromatic Compounds. St. Andrews, UK.
(Dr. P. J. Garratt, Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, UK.)

### INTERACTIONS IN SOLUTION

July 15–19. 7th International Symposium on Solute-Solute-Solvent Interactions. Reading, UK.
(Dr. A. D. Pethybridge, Department of Chemistry, The University of Reading, Whiteknights, Reading, Berkshire, RG6 2AD, UK.)

### MYCOTOXINS AND PHYCOTOXINS

July 22–25. 6th International Symposium on Mycotoxins and Phycotoxins. Pretoria, RSA.
(Dr. P. S. Steyn, National Chemical Research Laboratory, Council for Scientific and Industrial Research, POB 395, Pretoria 0001, Republic of South Africa.)

### MACROMOLECULES

August 18–23. 30th International Symposium on Macromolecules. The Hague, Netherlands.
(Dr. J. A. M. Smit, Gorlaeus Laboratories, University of Leiden, Department of Chemistry, P.O. Box 9502, NL - 2300 RA Leiden, Netherlands.)

### CHEMICAL EDUCATION

August 18–23. 8th International Conference on Chemical Education: Widening the Scope of Chemistry. Tokyo, Japan.
(Prof. M. Oki, Department of Chemistry, Faculty of Science, The University of Tokyo, Tokyo 113, Japan.)

### THERMAL ANALYSIS

August 19–23. 8th International Conference on Thermal Analysis. Bratislava, Czechoslovakia.
(Dr. P. K. Gallagher, Rm 6D-311 Bell Laboratories, Murray Hill, New Jersey 07974, USA.)

### MASS SPECTROMETRY

September 8–13. 10th International Symposium on Mass Spectrometry. Swansea, UK.
(Prof. J. H. Beynon, Royal Society Research Unit, University College of Swansea, Swansea SA2 8PP, UK.)

### IUPAC CONGRESS

September 9–13. 30th International Congress of Pure and Applied Chemistry. Manchester, UK.
(The Royal Society of Chemistry, Burlington House, London, W1V 0BN, UK.)

### CHEMICAL RESOURCES OF THE OCEAN

September 22–28. Chemical Resources of the Global Oceans — CHEMRAWN IV. Massachusetts, USA.
(J. R. Moore, Director, Marine Science Institute, University of Texas, Austin, TX 78712, USA.)

## 1986

### PESTICIDE CHEMISTRY

August 10–17. 6th International Pesticide Chemistry Congress. Ottawa, Canada.
(Dr. H. V. Morley, London Research Station, Agriculture Canada, University Sub-Post Office, London, Ontario, Canada.)

### NATURAL PRODUCTS

August 17–23. 15th International Symposium on the Chemistry of Natural Products. The Hague, Netherlands.
(Prof. U. K. Pandit, Laboratorium voor Organische Scheikunde, Universiteit van Amsterdam, Nieuwe Achtergracht 129, NL-1018 WS Amsterdam, Netherlands.)

### PHYSICAL ORGANIC CHEMISTRY

August 24–29. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan.
(Prof. M. Oki, Department of Chemistry, Faculty of Science, University of Tokyo, Tokyo 113, Japan.)

# CHEMISTRY & WORLD FOOD SUPPLIES

# THE NEW FRONTIERS

## CHEMRAWN II

◆

**Proceedings of the International Conference on Chemistry and World Food Supplies, Manila, Philippines, 6-10 December 1982**

Edited by

**L W SHEMILT**

*McMaster University, Hamilton, Ontario, Canada*

An interdisciplinary work which shows how the most modern research in chemistry, biochemistry and microbiology can be combined with new technologies in agriculture and food processing to ensure adequate food supplies for the future. The conference set the following objectives:

- To identify and put into perspective those areas of research and development having the potential to significantly increase food production and improve food storage and processing
- To strengthen scientific research in developing nations, particularly in those fields which require professional competence and initiative without excessive capital and human resources
- To accelerate implementation of research priorities and objectives by fostering cooperation among governments, industries and universities

The problem of adequate food and nutrition for the burgeoning populations in developing nations is a major one, with more than one billion people (about one-fourth of the world's population) presently known to be underfed or malnourished. These numbers and proportions may grow even faster than the world population, which is projected to rise to over six billion by the year 2000.

This is the second in the CHEMRAWN series of international meetings designed by the International Union of Pure and Applied Chemistry (IUPAC) to identify and address world needs amenable to solutions through chemistry. CHEMRAWN is IUPAC's acronym for Chemical Research Applied to World Needs. Co-sponsored by the International Rice Research Institute, this international, interdisciplinary conference brought together representatives from governments, industry and academia for the purpose of developing a strong sense of future research directions and priorities designed to meet the mounting food problem.

**Section Headings:** Soil and crop management for efficient use of water and nutrients. Integrated approaches to pest management. The role of chemistry and biochemistry in improving animal production systems. Contributions of chemistry and biochemistry to developing new and improved food sources. Chemistry and biochemistry in the processing and storage of food. Chemistry in the assessment and control of food supply. The forward edge.

**X:** *IUPAC Symposium Series*
600 pp June 1983
0 08 029243 7 Hardcover **£75.00 US$135.00**
0 08 029242 9 Flexicover **£42.00 US$75.00**
X = Books in series. Standing/continuation orders invited. A list of published volumes in each series is available free on request.

Prices are subject to change without notice. Sterling prices apply to UK and Eire customers only.

**PERGAMON PRESS**

Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

5A/24/7/83

# PESTICIDE CHEMISTRY: HUMAN WELFARE & THE ENVIRONMENT

*Proceedings of the 5th International Congress of Pesticide Chemistry, Kyoto, Japan, 29 August - 4 September 1982*

Editors-in-Chief: **J MIYAMOTO,** *Sumitomo Chemical Co Ltd, Takarazuka, Japan* and **P C KEARNEY,** *USDA, Beltsville, MD, USA*
Editors: **P DOYLE,** *ICI Plant Protection Division, Bracknell, Berks, UK,* **T FUJITA,** *Kyoto University, Japan,* **N TAKAHASHI,** *University of Tokyo, Japan,* **S MATSUNAKA,** *Kobe University, Japan,* **D H HUTSON,** *Shell Research Ltd, Sittingbourne, Kent, UK,* **S D MURPHY,** *University of Texas Medical School, Houston, USA,* **R GREENHALGH,** *Agriculture Canada, Ottawa, Ontario, Canada,* **N DRESCHER,** *BASF Aktiengesellschaft, Limburgerhof, Federal Republic of Germany*

Covers all aspects of pesticide science, chemical and biological, and their impact on man and the environment. Over 250 papers explore the complete range of problems associated with this extremely complex and economically important industry. The synthesis, chemical structure and biological activities of various pesticides are discussed in detail. Their modes of action and toxicology in the environment are explored, both as they affect pests and other life. In keeping with the importance of government regulation, residue analysis is a further vital topic. For pesticide scientists, organic and analytical chemists, and policy makers in government and industry.

**4 Volume Set**
1750 pp approx Spring 1983

0 08 029219 4 (H) **$390.00**

Prices are subject to change without notice.
X: Books published in series. Standing/continuation orders are invited.

**Contents (partial):**

**Volume 1: Synthesis and Structure-Activity Relationships**
Plenary Lectures: Political, economic and philosophical aspects of pesticide use for human welfare, **K H Büchel.** Pesticide research for the improvement of human welfare, **I J Graham-Bryce.** Synthesis of Pesticides and Growth Regulators: Stereoselective synthesis of pheromones via phosphonium ylides, **H J Bestmann.** Problems and opportunities with pheromones, **R Baker.** Chemical Structure and Biological Activity: Structure-activity relationships in derivatives of anticholinesterase insecticides, **T R Fukuto.** Sulfonylureas: new high potency herbicides, **G Levitt.**

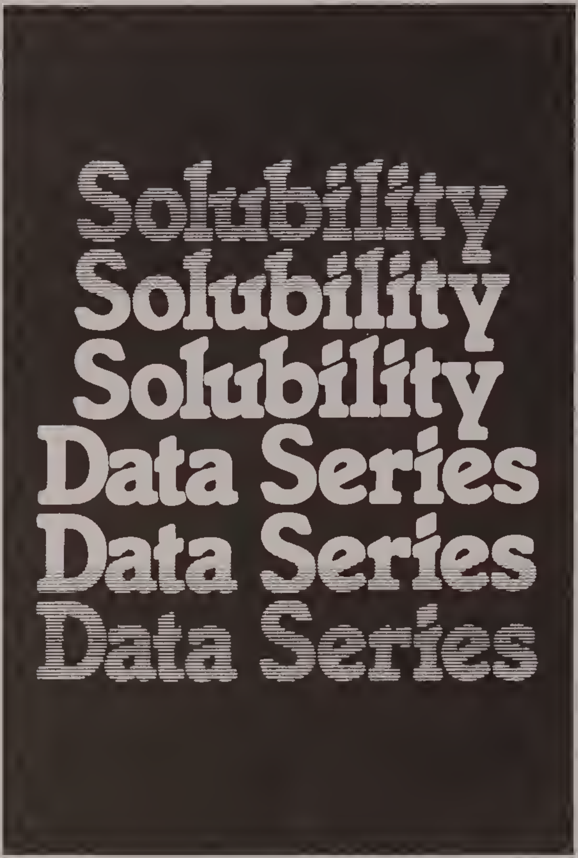
**Volume 2: Natural Products**
Bioactive Natural Products: Chemistry, Biochemistry and Physiology: Biological activities and structures of host-selective pathotoxins, **J M Daly** *et al.* Endocrine strategies for insect control, **W S Bowers.** Pyrethroid Insecticides: Biological Activity, Mode of Action, Metabolism and Toxicology. Antibiotics for Agricultural Use. Herbicides and Plant Growth Regulators for Rice Cultures.

**Volume 3: Mode of Action, Metabolism and Toxicology**
Biochemistry of Pests and Mode of Action of Pesticides: Behavioral and lethal actions of amidines on invertebrates, **R M Hollingworth.** Toxic oxygen species and herbicide action, **A D Dodge.** Metabolism and Degradation of Pesticides and Xenobiotics. Propesticides — bioactivation in pesticide design and toxicological evaluation, **J E Casida.** Selective toxicity conferred by activation, **W C Dauterman.** Toxicology of Pesticides and Xenobiotics: The role of biochemical studies in modern toxicological assessment of pesticides, **W N Aldridge.** Neurophysiological and behavioral assessment of pesticide toxicity, **A M Revzin.**

**Volume 4: Pesticide Residues and Formulation Chemistry**
Pesticide Residues and Methodology: Analysis of xenobiotics in air, **J N Seiber** *et al.* Pesticide residues in soil: problems between concept and concern, **H Frehse.** Formulation Chemistry: Dispersion science and technology in pesticide formulation, **Th F Tadros.** Developments in formulation and application technology for safe use of agrichemicals, **C Corty.**

X: *IUPAC Symposium Series*

PERGAMON PRESS
Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA



## SOLUBILITY DATA SERIES

The IUPAC series of critically-evaluated solubility data covering all physical and biological systems

Editor-in-Chief: A S KERTES, *Hebrew University of Jerusalem, Israel*

The *Solubility Data Series* has become established as the most authoritative and comprehensive numerical work of reference ever published on the subject of solubility. The 100 volumes to be published over the next ten years will systematically cover every solid, liquid and gas for which experimental data have been published. Data are critically evaluated paying particular attention to purity of reagents, experimental techniques and estimated errors. This multidisciplinary reference set will be essential in all libraries which serve the information needs of researchers in chemistry, chemical engineering, biology, materials science, medicine, pharmacology, the geosciences and environmental sciences.

**INDEPENDENT OPINION**

"The series has no real competition and deals with a subject intensely relevant not only to chemistry, but to geophysics, pharmacology, and engineering. Major research libraries can hardly refuse to subscribe."
*Journal of the American Chemical Society*

**Subscription Information**

| | |
|---|---|
| Annual subscription (1984) | **US$1350.00** |
| Two-year rate (1984/85) | **US$2565.00** |

**Published so far**

1 Helium and Neon
2 Krypton, Xenon and Radon
3 Silver Azide, Cyanide, Cyanamides, Cyanate, Selenocyanate and Thiocyanate
4 Argon
5/6 Hydrogen and Deuterium (2 volumes priced at $200.00)
7 Oxygen and Ozone
8 Oxides of Nitrogen
9 Ethane
10 Nitrogen and Air
11 Alkali Metal, Alkaline-Earth Metal and Ammonium Halides. Amide Solvents
18 Tetraphenylborates

FORTHCOMING VOLUMES
Oxides of Sulfur; Hydrogen Halides in Non-Aqueous Solvents; Alkali Metal Halates; Lanthanide Nitrates; Methane; Carbon Dioxide; Halogenated Benzenes, Toluenes, Xylenes and Phenols; Aqueous Silver Chloride Systems; Copper, Silver and Gold Halates.

---

FREE SPECIMEN COPIES AVAILABLE ON REQUEST
Advertising rate card available on request. Back issues and current subscriptions are also available in microform. Prices are subject to change without notice. Journal prices include postage and insurance. Sterling prices are available to UK and Eire customers on request.

**Pergamon Press**

Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

5B/6 11.82

**Chemistry International**

is the news magazine of the

# INTERNATIONAL UNION of PURE and APPLIED CHEMISTRY (IUPAC)

---

*President:* W. G. SCHNEIDER *(Canada)*
*Vice-President:* C. N. R. RAO *(India)*
*Secretary-General:* T. S. WEST *(UK)*
*Treasurer:* A. BJÖRKMAN *(Denmark)*

**IUPAC Secretariat**
Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)

Telephone: + 44 (865) 717744
Telex: 83147 attn. IUPAC    Telegrams: IUPAC OXFORD

---

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:
to promote continuing co-operation among the chemists of the member countries;
to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
to co-operate with other international organizations which deal with topics of a chemical nature;
to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 45 countries, each represented by a national organization, such as an academy of science or research council.

---

## NATIONAL MEMBER ORGANIZATIONS

Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
Asociación Química Argentina **(Argentina)**
Australian Academy of Science **(Australia)**
Verein Österreichischer Chemiker **(Austria)**
Comité National Belge de Chimie **(Belgium)**
Associação Brasileira de Química **(Brazil)**
Bulgarian Academy of Sciences **(Bulgaria)**
National Research Council of Canada **(Canada)**
Chinese Chemical Society, and Chemical Society located in Taipei, China **(China)**
Ministerio de Minas y Petróleos **(Colombia)**
Academia de Ciencias de la República de Cuba **(Cuba)**
Czechoslovak National Committee of Chemistry **(Czechoslovakia)**
Det Kongelige Danske Videnskabernes Selskab **(Denmark)**
Suomen Kemian Seura **(Finland)**
Comité National Français de la Chimie **(France)**
Deutscher Zentralausschuss für Chemie **(Federal Republic of Germany)**
Akademie der Wissenschaften der DDR **(German Democratic Republic)**
Association of Greek Chemists **(Greece)**
Hungarian Academy of Sciences **(Hungary)**
Indian National Science Academy **(India)**
Iraqi Chemical Society **(Iraq)**
Royal Irish Academy **(Ireland)**
Israel Academy of Sciences and Humanities **(Israel)**
Consiglio Nazionale delle Ricerche **(Italy)**
Science Council of Japan **(Japan)**
Malaysian Institute of Chemistry **(Malaysia)**
Koninklijke Nederlandse Chemische Vereniging **(Netherlands)**
Royal Sociey of New Zealand **(New Zealand)**
Norsk Kjemisk Selskap **(Norway)**
Sociedad Química del Perú **(Peru)**
Polska Akademia Nauk **(Poland)**
Sociedade Portuguesa de Química **(Portugal)**
Korean Chemical Society **(Republic of Korea)**
Council for Scientific and Industrial Research **(Republic of South Africa)**
Academia Republicii Socialiste România **(Romania)**
Consejo Superior de Investigaciones Científicas **(Spain)**
Svenska Nationalkommittén för Kemi **(Sweden)**
Schweizerisches Komitee für Chemie **(Switzerland)**
Supreme Council of Sciences **(Syrian Arab Republic)**
Türkiye Kimya Dearneği **(Turkey)**
Academy of Sciences of USSR **(USSR)**
Royal Society **(United Kingdom)**
National Research Council, National Academy of Sciences **(USA)**
Instituto Venezolano de Investigaciones Científicas **(Venezuela)**
Unija Hemijskih Društava Jugoslavije **(Yugoslavia)**

# Chemistry International

IUPAC

## *Contents 1984, No. 3 (June)*

1 Editorial
2 Problems at the interface of educational and employment systems—A report from West Germany
5 Change of Address
6 The role of Chemical Societies and their international relations for the promotion of chemistry
12 Provisional Recommendations
13 Letters to the Editor
14 Creation of the Société Française de Chimie
14 What is the 'Fondation de la Maison de la Chimie'?
16 The Max-Planck-Gessellschaft and its Institutes
17 ICSU: Report of the Secretary General
22 Revisions to schedule of 1984 meetings of IUPAC Bodies
23 Some remarks on the activities of the Analytical Chemistry Division (Division V)
24 JCBN Newsletter 1984
25 CNC-IUPAC Awards; Composites: Materials and Engineering
26 IUPAC-Sponsored Conferences
31 Other people's publications
32 IUPAC people
32 Recent Reports
35 IUPAC Conferences

ISSN 01

Printed by The Nuffield Press Limited, Oxford.

# Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

1984, No.4 (August)

Pergamon Press

# CHEMISTRY INTERNATIONAL

## The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Roger Fennell
PRODUCTION EDITOR: Richard J. Palmer

## EDITORIAL ADVISORY BOARD

*Chairman:* T. S. WEST *Secretary-General*
R. DEGAIN *Committee on Chemistry and Industry*
D. P. DEN OS *Committee on Publications*
L. PAOLONI *Committee on Teaching of Chemistry*
K. L. LOENING *Interdivisional Committee on Nomenclature and Symbols*
K. S. W. SING *Division I*
E. FLUCK *Division II*
N. J. LEONARD *Division III*
M. MANDEL *Division IV*
G. DEN BOEF *Division V*
L. E. COLES *Division VI*
D. B. TONKS *Division VII*
*Secretary:* R. W. FENNELL *Editor*

## SUBSCRIPTIONS

Six issues of *Chemistry International* will be published in 1985. Annual subscription rate including postage is US$20 for individuals, and US$40 for libraries. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, UK.

## REPRODUCTION OF ARTICLES

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*. Permission to reproduce articles will normally be granted at no cost to non-profit making bodies (such as National Adhering or Associated Organizations of IUPAC, National Chemical Societies, or International Scientific Unions). Permission for commercial publishers will normally be conditional upon publication of an advertisement for IUPAC publications. In all cases, please contact the IUPAC Secretariat for clearance.

Front cover: UNESCO Headquarters and the Director-General, M. Amadou Mahtar M'Bow
*(photo courtesy of UNESCO/Michel Claude)*

Pergamon Press

Oxford New York Toronto Sydney Paris Frankfurt
© 1984 International Union of Pure and Applied Chemistry

# EDITORIAL

Opinions expressed here are those of the author, and do not necessarily reflect the views or policy of IUPAC

In the last issue of CI there was a high proportion of material not directly of IUPAC origin which I hope you found to be of interest. This trend has been continued in this issue, with a major feature on chemistry in UNESCO. I had the opportunity to spend a few hours in the UNESCO buildings in Paris and tried to get a "feel" for the way that the Organization and chemistry interact, how its programmes help chemistry and what part chemistry plays in its programmes. Quite obviously it was not possible for me, in those few hours, to get a clear and complete picture of even a part of the overall programmes of such a large and, to the uninitiated, complex body. This article is therefore the result of splendid cooperation by people at UNESCO who converted my first hesitant attempt to tell their story into something much more realistic. However, if you think I (or they) have still not got the picture clear enough, we do run a "Letters to the Editor" section in CI — that is, when we have any letters!

This seems to be the year of the jubilee. We are pleased to be able to report on the 50th anniversaries of three bodies closely associated with IUPAC — the Indian National Science Academy, the Israel Chemical Society and the Chemical Society of Peru. As is the case with other items in CI, the coverage reflects only the material available and not in any way the relative importance of the respective bodies.

Other non-standard items in this issue include another article from a member of the Clinical Chemistry Division, this time Prof. W. C. Purdy of Commission VII.4. Is this the start of a flood of papers from Commissions and Committees on their work? See CI, 1984, No. 3, p. 1, para. 2. It was thought, although it is really a summary of what you probably already know, that you might like to see the 1983 IUPAC report to ICSU; I think you will agree that the lists of reports published during the year is most impressive and reflects the vast amount of hard work that goes on in IUPAC. It does no harm, I think, to remind those of our readers who are not involved in IUPAC that all this work is voluntary.

Nobody has written to tell me that the list of ISO Standards given in CI, 1984, No. 2, pp. 33–35 was or was not of use or interest, so I have completed the listing of those issued in 1983 on pp. 24–26, just in case someone is interested. Finally, you should by now have received your 1984 "new look" Supplement to CI which, because of the change in contents from previous years, has been sub-titled the *IUPAC Handbook*. Inevitably the names and addresses section was out of date the week after the *Handbook* went to press so we propose to try to keep you updated in the regular issues of CI. We are not quite sure how best to do this so if the layout of our first attempt, on pp. 46–47 does not suit you please let me know the reason and I will try to make a better job of it next time.

# Chemistry in UNESCO

UNESCO (for the United Nations Educational, Scientific and Cultural Organization) is an acronym that must be familiar to chemists internationally: IUPAC has been associated with UNESCO since soon after the latter's founding in 1945. Like IUPAC, UNESCO is concerned with international cooperation: its chemistry programme, however, is designed to be of particular assistance to developing countries.

This programme is essentially a self-help operation, with the better-endowed countries helping the not-so-well endowed. It is carried out mainly in developing countries, and depends directly on the support of chemists working in these countries.

UNESCO is an intergovernmental organization within the United Nations system with 161 Member States; its programmes must therefore respond to the priorities of these States. UNESCO's Secretariat, based in Paris, is divided into sectors representing its three main areas of responsibility: education, science and culture. Two of these sectors are involved in its chemistry programmes.

The Science Sector, through its Division of Scientific Research and Higher Education (headed by Dr. V. Zharov), has the major responsibility, in collaboration with five UNESCO Regional Offices* for Science and Technology and a Bureau for Scientific Cooperation in Europe at UNESCO's Paris headquarters. The Education Sector, through its Division of Science, Technical and Vocational Education (led by Dr. S. R. Samady), carries out programmes in school science teaching, out-of-school education and life-long education. The Regional Offices are assigned the important function of ascertaining the priorities of Member States and of looking after the day-by-day administration of the projects.

## BACKGROUND

In the Science Sector, UNESCO's present programmes began to emerge as a separate entity in the early 1970s out of UNESCO/UNDP (United Nations Development Programme) field projects which were concerned with the establishment and the strengthening of science faculties in the young universities of newly-emerging countries. These programmes, which were funded by UNDP and managed by UNESCO, had been under way throughout the 1960s and provided direct aid in the form of expatriate teaching staff, equipment, and an overseas Ph.D. training programme for their local staff. The planning of the new UNESCO programme was thus concerned with helping staff in these new universities carry out their teaching and research in their own environment.

In 1974 planning began for two new programmes in chemistry — one in research and training in natural products chemistry, the other related to laboratory curriculum development at university level. The former began almost immediately as the Regional Network for the chemistry of natural products in South-East Asia and the latter as a series of laboratory workshops, in different geographical areas, devoted to the development of a series of experiments which could be used in the earlier part of an undergraduate chemistry course. Natural products chemistry eventually spread to other areas, particularly South and Central Asia, and to other associated fields, such as medicinal and aromatic plants.

Progress in university chemical education moved very quickly — helped undoubtedly by the involvement of the IUPAC CTC right from the planning stage. This programme now includes the joint UNESCO/IUPAC project on low-cost, locally-produced equipment; a programme for university/industry cooperation; and a joint programme with physics on technician training and the use of computers in university education. Meanwhile programmes on environmental chemistry had been added and, more recently, after a long planning period, programmes in analytical and inorganic chemistry became operational. In 1981, UNESCO created the International Organization for Chemical Sciences in Development (IOCD), which was designed as a mechanism through which chemists in both developing and industrialized countries could collaborate

---

*The regions defined by UNESCO are: Africa, Arab States, Europe and North America, Latin America and the Caribbean, South and Central Asia, and South-East Asia.

# ORGANIZATION OF UNESCO

Under the Director-General there are ten Assistant Directors-General, in charge of the following areas:

| | |
|---|---|
| The Executive Office | Culture |
| Studies and Programming | Communication |
| Education | Cooperation for Development and External Relations |
| Natural Sciences and their Application to Development | Programme Support |
| The Social and Human Sciences | General Administration |

As chemists, we are primarily concerned only with the areas of Education and of Natural Sciences. Each of these has a number of Divisions —

| **Education** | **Natural Sciences** |
|---|---|
| Division of Structures, Content, Methods and Techniques of Education | Division of Ecological Sciences |
| Division of Educational Policy and Planning | Division of Science and Technology Policies |
| *Division of Science, Technical and Vocational Education* | Division of Earth Sciences |
| Division of Financing of Education | *Division of Scientific Research and Higher Education* |
| Division of Higher Education and of Training of Education Personnel | Division of Water Sciences |
| Division of Equality of Educational Opportunity and Special Programmes | Division of Technological Research and Higher Education |
| Literacy, Adult Education and Rural Development Division | *Division of Marine Sciences* |
| Operational Programmes Division | Operational Programmes Division |

— and satellite bodies —

| | |
|---|---|
| International Bureau of Education (Geneva) | *Scientific Cooperation Bureau for European & North American Region* |
| International Institute of Educational Planning (Paris) | *Secretariat of the Intergovernmental Oceanographic Commission* |
| European Centre for Higher Education (Bucharest) | |

— not to mention Regional Offices:

| | |
|---|---|
| — for Education in Africa (Dakar) | — for Science and Technology (S & T) for Africa (Nairobi) |
| — for Education in Latin America and the Caribbean (Santiago) | — for S & T for Latin America and the Caribbean (Montevideo) |
| — for Education in the Arab States (Beirut) | — for S & T for the Arab States |
| — for Education in Asia and the Pacific (Bangkok) | — for S & T for South and Central Asia (New Delhi) |
| | — for S & T for South-East Asia (Jakarta) |

Those bodies specifically mentioned in the text are indicated by italics.

in improving and strengthening the chemical sciences in the poorer countries.

The UNESCO chemistry programmes depend on the commitment of individuals, institutions and organizations. From the early 1960s UNESCO realized the absolute necessity of remaining in close contact with the world scientific community and, in addition to its close ties to ICSU, it has carried out cooperative activities with the different professional unions. Support is also provided to help national professional societies in developing countries with their programmes. The UNESCO chemistry programmes also maintain close contact with the regional chemical federations and indeed, in 1978, helped to form the Federation of Asian Chemical Societies.

## SCIENCE SECTOR CHEMISTRY PROGRAMMES

### *University chemical education*

This programme began in 1975 with a laboratory-based workshop at the Seoul National University, Korea, attended by university teachers from countries in South-East Asia. Participants carried out the experiments collected from the region prior to the workshop and then wrote them up in a manner in which they wished to present them to their students. The experiments were subsequently rechecked and were published as *A Sourcebook of Chemical Experiments, Volume 1*. This was not an attempt to produce an international laboratory manual for the first year of university, rather it was to serve as a source of tested experiments from which teachers could pick and choose to suit their own curricula and resources. A special section for teachers was also included. A second workshop followed at the University of Jordan in 1976 which followed much the same pattern, with university teachers from seven Arab States. This working group examined, in a practical way and in discussion, a representative collection of some sixty first-year chemistry experiments grouped under the headings stoicheiometry, energy, rates of reaction and equilibrium. From this workshop *Sourcebook of Chemical Experiments, Volume 2* resulted.

In 1977 a Workshop for Latin American countries was held in Mexico. Here the Asian approach was adapted to Latin American needs. As a first step the large teaching staff of the National Autonomous University of Mexico (UNAM) student-tested all the experiments in Volumes 1 and 2, 'latinized' and then wrote them up (in Spanish) for the working group. This time the working group was a series of discussion groups who determined which experiments were the most suitable for their curricula. The result of their labours was the *Manual de Experimentos Quimicos, Tome 3*. This then served as background material for a series of national workshops for Latin American countries. The next working group met in Lome, Togo, in 1977 and prepared a series of experiments (in English and French) which have been circulated to universities in African countries for student testing.

The first French language laboratory-based workshop was organized at l'Université des Sciences et Techniques du Languedoc, Montpellier, France, in association with Société Chimique de France; *Volume 5, Manual d'Expériences de Chimie* resulted. All these workshops also produced sets of recommendations which laid down priorities for future activities. These included the need to find alternative sources for laboratory teaching equipment for countries that could not hope to import it.

The search for new sources of laboratory equipment resulted in the beginning of a programme in designing, developing and producing laboratory teaching equipment locally — a programme coordinated by IUPAC CTC and directed by the University of Delhi. It is hoped that it will expand into other Asian and African countries in the next 2 or 3 years and that, eventually, equipment for undergraduate laboratories can be produced in many locations in developing countries.

Currently, Dr. Krishna Sane and his group at the University of Delhi have produced a conductometer, various types of pH meters, as well as colorimeters, polarimeters and some other small pieces of equipment. These have been shipped to Guyana for a training course for teachers from English-speaking Caribbean countries and to Brazil for a training course for university teachers from Latin America. These courses also served as a centrepiece for a workshop in July 1983 at the Royal School of Educational Studies in Copenhagen. This institution and a member of Dr. Sane's group are now working on the development of a very low-cost visible spectrometer. Each training course gives university teachers an opportunity to assemble the pieces of equipment so that, when back in their own institutions, they will not encounter any maintenance difficulties. The next step in this type of assistance is one that will tackle the recurrent problem of chemical costs — this will mean programmes in the production of the more expensive chemicals needed for teaching.

At an international level the UNESCO programmes in university chemical education are currently being drawn together within the International Network for Chemical Education (INCE). The International Centre for Chemical Studies in Ljubljana, Yugoslavia, is acting as the coordinating centre and other associated centres are being established in Denmark, France, the United Kingdom and the United States. Current plans foresee other centres in Asia, Africa and in the Arab States. It is hoped that, as well as the present activities described above, the network will provide a fellowship programme and a technical information service.

### *University/Industry cooperation*

Developing countries have given prominence to the need for their universities to help in their socio-economic development, and UNESCO programmes in science and technology have reflected this through programmes in university/industry cooperation. The start of such a programme for chemistry began with an International Symposium in Toronto, Canada, in 1978 attended by participants from 78 countries, followed by regional symposia which prepared regional programmes.

The university/industry programme in chemistry now has the following elements: national committees with representatives from university, industry and government; student placement in industry on an inter-country basis; entrepreneurial training courses for young graduates wishing to set up small-scale industry; training programmes for industrial tutors in university and courses in industrial operations; and R & D services including pollution, monitoring and control.

### *Training and research*

UNESCO programmes exist in training and research in almost every discipline and at every level. Thus, under the UNESCO fellowship programme, awards are given for scientists from developing countries to continue their studies overseas, both at pre-doctoral and post-doctoral level. At the same time UNESCO sponsors post-graduate, post-doctoral, long-term courses of 1 year in certain universities. Examples are courses in physical chemistry at the Catholic University of Louvain in Belgium, natural products at the University of Uppsala in Sweden, physical chemistry at the Charles University, Czechoslovakia, and an introductory course in research techniques at the University of New South Wales in Australia.

An approach much favoured by UNESCO is the creation of regional networks, founded on the principle of self-help augmented by mutual cooperation. It relies on existing facilities and resources and provides an organization which allows each institution to contribute as much as it can — or wishes — and to seek assistance from their colleagues in other countries in the network. This system also provides an efficient way of using the very limited funding available, provided mainly by the Member States themselves (most of which are developing countries) supplemented by contributions from UNESCO's regular programme budget.

The most successful of these UNESCO regional networks is in the South East Asia region where the chemistry of natural products is being studied. The region extends from Malaysia to Fiji, from Korea to New Zealand, an area with a real potential for development and exploitation of natural products. The natural products network consists of ten Member States and the programme is directed by a Coordinating Board — one chemist from each participating Member State — and monitored by Chulalongkorn University, Bangkok, Thailand. Among the activities of this network are:

Training courses (2–3 weeks) for young chemists in techniques and interpretation of data — about 600 have availed themselves of these opportunities so far;

Exchange programmes which allow institutions to invite eminent chemists to assist in their research programmes and individuals to obtain short-term fellowships to train in other institutions in the region;

Collaborative research programmes usually involving three or more institutions in different countries;

- Production of the newsletter *Chemistry in Asia*, a highly successful enterprise providing information on regional activities and publications, international programmes and a directory of natural products chemists;
- Provision of research analytical services, NMR, Mass Spectrometry, etc.

The success of this network may be attributed to the choice of a limited (and relevant) subject area, the involvement of some outstanding members and the generous support from Japan and, more recently, Australia.

Another network established by UNESCO is in Africa where the activities sponsored relate to environmental chemistry — training courses are run on the various analytical chemical techniques associated with environmental monitoring. In particular, annual training courses are held in both East and West Africa in pesticide analysis.

The recently created Asian Network for Analytical and Inorganic chemistry is a joint UNESCO/FACS venture. Its 1984 programme includes workshop/training courses in field-oriented analytical chemistry (in Sri Lanka in December) and a training course in management (in Malaysia). This network will also take over responsibility for instrument technician training (in Asia) and a prototype course will be organized by the Institute of Chemistry, Malaysia, with help from Australian chemists.

UNESCO also organizes, and/or supports, research seminars and symposia in developing countries. One of the more prominent series are the Asian Symposia on Medicinal Plants and Spices which are held every four years. This year the fifth in the series will be held in Seoul, Republic of Korea, in August.

UNESCO is also responsible for the execution of UNDP-financed projects (described earlier) in chemistry in developing countries. These cover a whole range of topics, e.g. New Methods in Chemical Analyses, in Vietnam, and Research in Natural Products Chemistry at the University of Asuncion, Paraguay.

### *Scientific Cooperation Bureau for the European and North American Region*

As with all UNESCO scientific cooperation programmes the basic aim is to bring together scientists from all over the region, particularly in this instance those living in the eastern and western spheres of political interest. In this way it is hoped to encourage the free flow of information on research findings throughout the region, if possible before publication so as to avoid duplication of effort, and also to promote mechanisms for working out priorities and strategies in discipline-based or problem-oriented research, and hence to foster research cooperation between individuals and institutions — thus minimizing costs and maximizing participation of scientists in the region.

The method used by UNESCO to achieve these objectives is to offer financial assistance to aid in the exchange of scientists and to promote the holding of scientific meetings. The exchange of scientists occurs mainly at two levels — among senior staff (Professor or Head of Department) for about a week, and longer-term (about 3 months) among research scientists between regional institutions; the first is aimed at the verbal exchange of information and ideas and discussion of progress, whereas the second provides opportunities for the younger post-graduates actually to collaborate in experiments. The scientific meetings sponsored by UNESCO (which carefully tries to avoid overlap with ICSU Unions) mainly take the form of 'workshops' — about 25 people meeting for about 1 week. These meetings are organized in areas of interest to the countries of the region to highlight current trends in fundamental or applied research. This has allowed the setting up of cooperative research carried out by a network of institutions in the region working in similar or related fields. The cooperative research programmes developed to date are:

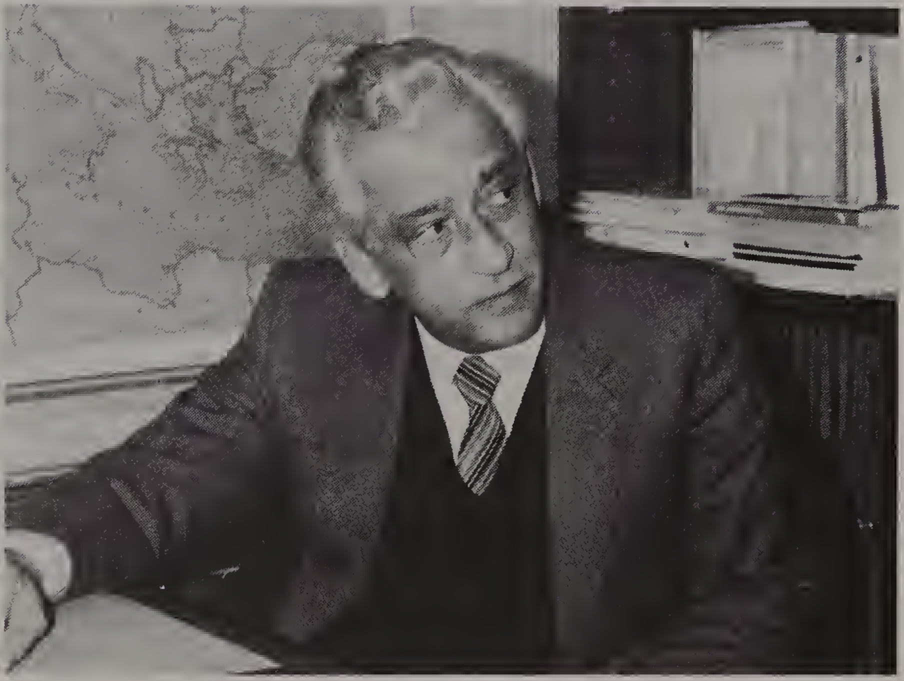
- Chemistry of organic natural products and chemical ecology;
- Electrochemistry, mainly devoted to energy, environmental and materials problems;
- Molecular and cell biophysics;
- Biomaterials and biotechnology;
- Applied mathematics and systems analysis.

Leading this Bureau is Dr. José Jaz.

### *Division of Marine Sciences*

The programme of the Division of Marine Sciences involves an integrated approach to

Dr. John V. Kingston, Programme Specialist, Research and Training in the Chemical Sciences



Dr. José Jaz, Programme Specialist, Scientific Cooperation Bureau for Europe

Dr. Dale C. Krause, Director, Division of Marine Sciences

**Some Science Sector personalities,** *(photos courtesy of UNESCO/Michel Claude)* physical, chemical, biological and geological oceanography, both of the open ocean and of the coastal waters, and the educational aspects of ocean engineering, as well as the interface with management of the marine environment and marine resources. One third of the programme promotes the global advancement of marine science and two thirds promote marine science in developing countries. Leading this Division is Dr. Dale C. Krause.

The chemistry associated with the work of this Division must necessarily be 'applied'. As marine waters are the media for numerous biological systems which affect the purely chemical systems, it can be seen that chemical generalizations have to be viewed with extreme caution. Consider, for example, that the three marine biological environments — estuarine, coastal and open ocean — may also be subdivided into an upper euphotic zone, where biological activities take place; deeper layers, where decomposition mainly occurs; and in the oceans, a bottom homogeneous water layer with an interface with ocean sediments. All of which is evidence of the specialized and complicated chemistry involved.

Much of the Division's chemistry is carried out in cooperation with the international scientific community, represented by ICSU, especially its Scientific Committee on Oceanic Research (SCOR). Notable achievements of cooperation between UNESCO, SCOR, ICES (the International Council for the Exploration of the Sea) and IAPSO (the International Association for the Physical Sciences of the Ocean) have been the adoption by the Joint Panel on Oceanographic Tables and Standards (JPOTS) of the *Practical Salinity Scale 1978* (based on conductivity relative to a very accurately-known potassium chloride solution) and the *International Equation of State of Seawater 1980* (which enables calculation of density from measurements of salinity, temperature and pressure, or from other parameters dependent on these). As an outcome of these activities, UNESCO publishes the *International Oceanographic Tables* as a worldwide service for the oceanographic community. JPOTS is also studying the thermodynamics of the $CO_2$ system in sea water with a view to publishing an accepted set of constants.

One example of a project investigated by SCOR, with reports published by UNESCO, is a study of the carbon budget of the oceans, both elemental carbon from the deliberate or accidental burning of biomass and combined carbon ($CO_2$ from combustion of biomass or fossil fuels and carbonates in the oceans or their sediments). Another example is a study on the determination of chlorophyll in sea water, which involves a good deal of careful separative analytical chemical methods, followed by spectrophotometry and fluorometry. Clearly chemistry, bio- and geochemistry play a large part in these investigations.

There are also a number of other marine science investigations, funded by UNEP or UNDP, involving chemistry, concerned primarily with contamination and pollution.

### *Secretariat of the Intergovernmental Oceanographic Commission (IOC)*

The IOC (Secretary Dr. Mario Ruivo) is a semi-autonomous body within UNESCO, whose Member States are not necessarily members of UNESCO. It is funded by UNESCO (70%) through its regular budget and by its Member States, through contributions to the IOC Trust Fund, and supported by the UN, FAO, WMO and IMO through the Intersecretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO).

The Commission's purpose is "to promote scientific investigation with a view to learning more about the nature and resources of the oceans through the concerted action of its Member States". One can see immediately that a very important role must be played by analytical chemistry in order to further this stated objective. Indeed, a large programme — the Global Investigation of Pollution in the Marine Environment (GIPME) — has been mounted, concentrating on petroleum mounted, concentrating on petroleum hydrocarbons (the most widely known modern marine pollutant), organohalogen compounds (especially polychlorinated biphenyls) and certain trace metals and metalloids (especially Hg, Cd, Pb, Cn, Zn, Ni, Se and Co).

This programme is aimed, in the long run, at deciding whether any regulatory action is necessary and if so, to provide the scientific basis for Member States to implement this regulatory action. However, in order to make such a decision a great deal of research and information-gathering must be done. For each possible contaminant a baseline (i.e. normal, natural, concentration) must be found; then, mass-balances — the relation between influx and efflux of the contaminant in each of the major environmental compartments (e.g. water, sediments, organisms, ocean atmosphere) — can be made which, by considering the effects of a given contaminant on man (directly or indirectly) and on the long-term stability of the marine ecosystem, can be converted into a pollution assessment.

Without going into any detail, the magnitude of the programme can be visualized by considering the extent of the oceans, the forms in which a given contaminant may be found (dissolved in water, in marine organisms or in suspended matter), the problems of adequate sampling and the purely analytical problems of possible interferences by other elements or compounds. A very important body in this programme is therefore the GIPME Group of Experts on Methods, Standards and Intercalibration (GEMSI) who have to oversee the following four vital analytical chemical processes:

1. Development of techniques;
2. Testing of the techniques to assess their precision and accuracy;
3. Intercomparison of techniques and the selection of 'recommended' ones;
4. Preparation of manuals and training of potential users.

Since January 1984, this IOC Group of Experts has been cosponsored by UNEP.

Clearly there is an enormous amount of analytical chemistry to be done — both research and measurements — but also, in order that the mass-balances may be determined and understood, biochemistry and geochemistry. Once again, regional networks have been established in order to get the work done efficiently and economically and the IOC does not work in isolation — amongs others, cooperation with UNEP, FAO, WMO and ICSU SCOR is maintained. An important part of this process is the gradual development by IOC and UNEP of the Marine Pollution Monitoring System (MARPOLMON).

Pollution is not, of course, the only concern of IOC. There is a long-term programme of oceanic exploration and research, with programmes on: ocean science in relation to living, and to non-living, resources; the chemical composition of the marine environment and state of health of the oceans; ocean dynamics and climate; ocean mapping and supporting ocean services (the ICO-WMO Integrated Global Ocean Services System — IGOSS — and the IOC International Oceanographic Data Exchange — IODE) as well as Training, Education and Mutual Assistance in the Marine Sciences (TEMA). Chemistry plays a significant role in many of these programmes.

Interested readers are recommended to read the report entitled *Ocean Science for the Year 2000* prepared for the IOC by the ICSU Scientific Committee on Ocean Research (SCOR) and the FAO Advisory Committee on Marine Resources Research, published by UNESCO in 1984. This includes a 16-page chapter on "Chemistry of the Ocean".

## CHEMISTRY PROGRAMMES IN THE EDUCATION SECTOR

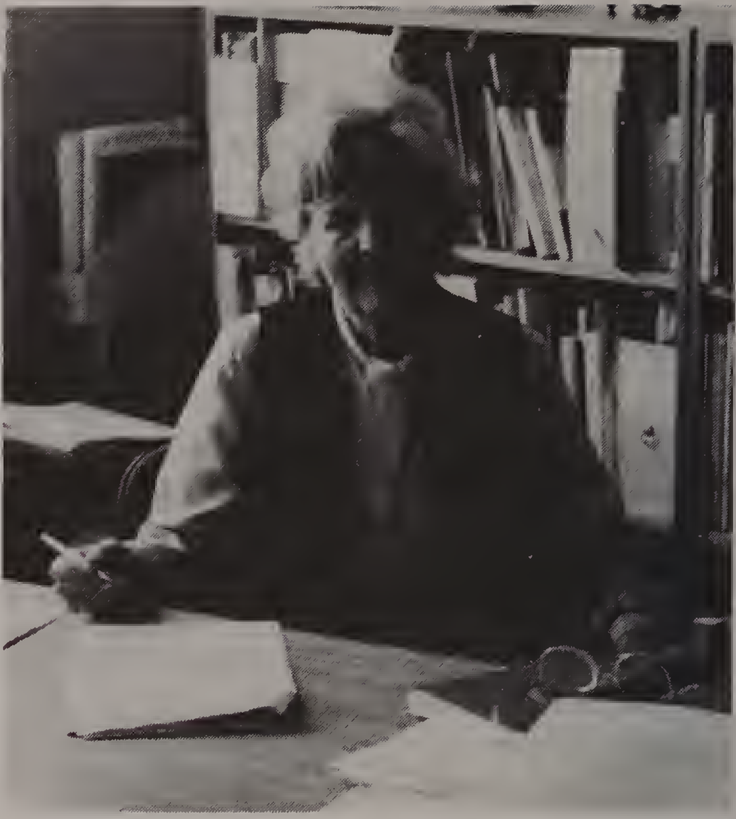
The Science Education Section of the Division of Science, Technical and Vocational Education is concerned with the teaching of chemistry up to the secondary (high school) level.

The programme in chemistry education, at this pre-university level, includes the following activities:

(i) exchange of ideas and information concerning recent developments in various aspects of chemistry teaching;
(ii) preparation of resource materials for use of chemistry educators;
(iii) training of key personnel;
(iv) out-of-school activities in chemistry.

In recent years a series of publications has been produced and a number of international conferences held. Often the one follows the other — a publication is produced based on the proceedings of a meeting and including an edited version of some of the material prepared for the meeting. One such publication is Vol. IV of the series *New Trends in Chemistry Teaching* — a series prepared in close collaboration with the IUPAC Committee on Teaching of Chemistry. The thirteen 'trend' papers in this volume were prepared after a preliminary survey of the literature and were then revised after the discussions held at the International Congress on the Improvement of Chemical Education (Wroclaw, Poland, September 1973) before being published. Recommendations for action, incorporating the opinions identified at the final plenary session, constitute the final section of the volume. The other four volumes of the series are collections of published papers on subjects considered to be of use to chemistry educators world-wide. The volumes were published in 1967, 1969, 1972, 1975 and 1981. A source-book for chemistry teachers, *Teaching School Chemistry,* will be published in 1984. UNESCO has worked in close cooperation with the IUPAC CTC in the organization of seven international conferences on chemistry education held during the past decade (see CI, 1984, No. 3, pp. 39–41 for a report on the 1983 Conference at Montpellier, France). In 1982 a UNESCO Symposium was held on Chemistry Teaching and the Environment. It must not be forgotten that UNESCO has regularly contributed towards the costs of producing and distributing the *International Newsletter on Chemical Education* produced by IUPAC CTC.

**Dr. S. R. Samady, Head of Division of Science, Technical and Vocational Training**


**Mrs. Sheila Haggis, Chief, Scientific Education Section**

Chemistry teaching resource materials of various kinds, including printed materials, audio-visual aids and low-cost equipment have been developed with UNESCO's assistance. This assistance has taken the form of establishing contracts with professional institutions or working groups, and the sending of short-term consultants to assist in particular projects.

Training activities for chemistry curriculum development workers, teacher educators and other key personnel have been undertaken on a sub-regional or national basis. Such activities have also included short-term fellowships and study tours.

Cooperation with UNESCO's Member States for the development of their chemistry education has taken various forms. In some countries assistance has been given for the establishment of national institutions, such as science teaching centres or teacher training colleges, where chemistry education has been an important component of science education development as a whole. UNESCO, working with other organizations, such as UNDP and the World Bank, has provided the services of specialists in chemistry education and fellowships for the training of national personnel. It has also provided equipment and teaching materials of various kinds. Support has also been provided for out-of-school activities such as chemistry olympiads.

### CONCLUSIONS

It is very likely that the above brief survey may well have missed some chemistry in the vast and, to the uninitiated, complex structure of UNESCO and its operations. Even so what has been described indicates a considerable interest in chemistry.

In many cases UNESCO depends on the active support of other bodies — the ICSU Unions, local Chemical Societies and regional federations, as well as individual chemists — to help in carrying out its programmes. The bulk of these programmes are for the benefit of the developing areas of the world, although many of the actual projects (e.g. those of the Division of Marine Sciences and of the IOC) necessarily benefit the world at large.

So far as chemistry is concerned UNESCO is indeed carrying out its purpose of promoting cooperation between nations.

*The Editor is pleased to acknowledge the invaluable assistance of Mrs. S. M. Haggis, Dr. J. V. Kingston and Mr. D. Spurgeon in the preparation of this article.*

### APPENDIX — ACTIVITIES IN 1983

| | |
|---|---|
| January: | Arab States seminar on environmental chemistry, Amman, Jordan. |
| March: | Regional seminar on natural products chemistry and agro–industry, Medan, Indonesia. |
| June: | Seminar on industry education interactions at graduate and senior technician level, London, UK. |
| | International seminar on photochemical conversions, Lausanne, Switzerland. |
| July: | Regional workshop on low-cost equipment, Sao Paulo, Brazil (with IUPAC). |
| August: | Caribbean workshop on low-cost equipment, Georgetown, Guyana (with IUPAC). |
| | Support to the seventh IUPAC conference on chemical education, Montpellier, France. |
| | Support to the IUPAC workshop on the production of low-cost equipment, Copenhagen, Denmark |
| | Interdisciplinary training course on insect chemoreception, Nairobi, Kenya. |
| | Fourth sub-regional workshop on university chemical education, Ecuador. |
| | Workshop on the interpretation of spectral data in structural analysis, Peru. |
| October: | International workshop on ethanol production, Guatemala. |
| November/ December: | Regional workshop on characterization techniques in biochemistry and chemistry of natural products, Thailand, Bangkok. |
| December: | First meeting of the regional network for environmental chemistry in the Arab States, Tunis, Tunisia. |
| | Sub-regional environmental chemistry workshop on air pollution, Harare, Zimbabwe. |
| | Fifth laboratory workshop on environmental chemistry techniques, Zambia. |

---

## RECENT REPORTS

# Recommended standards for reporting photochemical data (*Recommendations 1983*)

The assessment or reinterpretation of experimental results requires that the reports contain sufficient information about experimental procedures and conditions. This is, of course, especially important in order to allow repetition of experiments by other investigators. While some experimental practices are so standard or common as to be assumed, many are not. It is, therefore, important that the crucial experimental parameters be included in published reports.

The purpose of this document is to recommend a comprehensive set of experimental parameters and data manipulation methods that should be reported in published accounts of photochemical investigations and attendant spectroscopic studies.

The following aspects are covered in these recommendations:

**I. Photochemical Reactions**
  A. Conditions
  B. Quantum Yields
  C. Chemical Yields
  D. Kinetics

**II. Absorption Spectroscopy**
  A. Display
  B. Conditions
  C. Transient absorption and flash kinetics
  D. Action spectra

**III. Luminescence Spectroscopy**
  A. Display
  B. Conditions
  C. Kinetics
  D. Luminescence yield
  E. Excitation spectra

F. Chemiluminescence

## IV. Abstract

This Commission III.3 report was published in PAC, Vol 56, pp. 939–944 (1984).

# Non-extractable pesticide residues in soils and plants

The information available on the nature, identity and properties of non-extractable (bound) pesticide residues formed in plants and soils is reviewed. In particular, definitions of non-extractable residues are given and progress in our understanding of the nature and significance of these materials is critically appraised.

Most work has been carried out on non-extractable residues in soils since in a number of cases such material may constitute a large proportion of the residual pesticide (as detected using radiochemical techniques). Apart from studies of the factors affecting formation of non-extractable residues, model experiments involving incubation of humic acid monomers with chlorinated anilines have been conducted to provide insight into the nature of covalent binding that occurs. Examples of the bioavailability of soil non-extractable residues to plants are given.

In the case of plants it is particularly important to distinguish between the binding or incorporation of parent pesticide, pesticide metabolites or (radiolabelled) $CO_2$ with plant macromolecules. Plant growth is one of the important factors which can have an effect on formation of non-extractable residues. Sequential extraction schemes have been used on a case-by-case basis to try to establish the localisation of binding (e.g. with lignin, polysaccharides, etc.).

It is concluded that a sequential approach to studying non-extractable residues is recommended. Information on bioavailability of soil residues to plants, and of plant residues to animals, is likely to be of greater importance than a knowledge of chemical identity of the residues in the majority of cases.

This report from Commission VI.5 was published in PAC, Vol. 56, pp. 945–956 (1984).

# $\beta_2$-Microglobulin and other urinary proteins as an index of cadmium-nephrotoxicity

$\beta_2$-Microglobulin is a low molecular mass protein which is commonly regarded as the most sensitive index of cadmium nephrotoxicity in man. The determination of this protein, however, is hampered by its lability in urine below pH 5.5. An alternative is the determination of retinol binding protein. However, before choosing which protein should be determined, more information is needed about the relationship between proteins and cadmium exposure. First it is clear that any increase in urinary protein excretion should be viewed with concern. The aim of protein determination should be to provide an early indication of kidney damage in cadmium-exposed persons.

The relationships between the concentrations of proteins in urine and the concentration of cadmium in the kidney are complicated. However, the relationships between the concentrations of proteins and the concentration of cadmium in urine are somewhat simpler, even though age is an important factor. Kidney dmage may occur either in the tubulus, in which case the low molecular mass proteins are a useful index, or in the glomerulus, in which case the high molecular mass proteins are indicative. Critical concentration values for cadmium in kidney cortex and liver, and for cadmium and proteins in urine are given. For $\beta_2$-microglobulin the determination procedures are considered critically and recommendations for preferred methods are offered.

This report by Commission VII.4 was published in PAC, Vol. 56, pp. 957–965 (1984).

# Results of a collaborative study on zirconia-based oxygen gauges

Electrochemical gauges based on stabilized zirconia are now used extensively to measure oxygen activities in processes involving gaseous, liquid or solid phases. The devices operate at high temperatures ($\geqslant$ 900 K) and are susceptible to errors arising from the relatively severe environmental conditions which they encounter. In this report the importance of the various complex factors which influence the performance of gauges fabricated from a variety of commercially available electrolyte materials have been assessed. Tubes which were especially manufactured for the project from five different types of stabilized zirconia have been studied in ten collaborating laboratories. The microstructures of the materials have been examined in detail and the techniques used to apply electrodes and to incorporate the tubes into oxygen gauges have been evaluated. The gauges have been subjected to a series of standard electrochemical tests and their performances have been critically examined and assessed. The devices have also been tested at very low oxygen potentials and at higher temperatures to determine the effects of electronic conductance in the stabilized zirconia and of its partial permeability to oxygen. All the experimental data were analyzed centrally and the study has made it possible to lay down guidelines for the fabrication of such gauges and to quantify the level of accuracy which can be achieved.

This report is from Commission II.3 and was published in PAC, Vol. 56, pp. 1069–1094 (1984).

# Voltammetry at glassy carbon electrodes

The capabilities of glassy carbon indicator electrodes are documented. Accurate information and reproducible data can be obtained on a wide variety of redox systems in diverse solvents.

In general, glassy carbon compares favorably with other electrode materials in terms of its combined anodic and cathodic electroactivity range. However, judicious pretreatment and handling of glassy carbon electrodes are required in order to obtain meaningful results. Sources of supply of glassy carbon electrodes and their appropriate pretreatment are described, including physical (mechanical, etc...), chemical, and electrochemical procedures. The working range of potentials of glassy carbon is listed in the solvents water, propylene carbonate, benzonitrile, acetonitrile, tetrahydrofurane, n-propionitrile, dimethylformamide, 1,2-dichloroethane, and in several molten salts. The voltammetric characteristics of numerous redox systems are tabulated, based on data in the published literature and on personal communications from thirty-eight (38) laboratories worldwide.

This report by Commission V.5 was published in PAC, Vol. 56, pp. 1095–1129 (1984).

## Improved cost-effective approaches to pesticide residues analysis

Sample collection and preparation stages are time consuming and labour intensive. However, there are few obvious savings to be made in this area. It is necessary to collect an appropriately large sample and to reduce the sample size by well-tested procedures. The only important savings can be made by extracting a small final sample. Improvements can be made in the clean-up of the extract prior to final determination. This stage can be speeded up by reducing the sample size or by taking an aliquot of the extract through the clean-up procedure. Reduction of scale is possible with conventional equipment but, for true miniaturisation, specially designed laboratory equipment is needed. For many analyses, especially when methods are miniaturised, the use of internal standards (IS) can be valuable. The IS must behave in an identical way and be a compound of very similar chemical structure to the test compound. The IS should be added at the extraction stage and carried through each stage of the analysis. The usefulness of IS in pesticide residue analysis has become accepted and their use should be encouraged. Recovery data for the IS and for the compound to be determined, as well as relative response factors, should be published together with the results. In recent years, a variety of laboratory procedures have been automated. Fully automated GLC and HPLC procedures are available for the determination of pesticide residues at the subnanogram level. The latest developments in automation and miniaturization of the extraction and the clean-up have shown that this difficult and costly part of the analysis can be automated and hopefully integrated with the well-developed step of determination by gas and liquid chromatography. A more radical alternative to improving residue analysis is by adopting immunochemical techniques. Immunochemical techniques, especially the ELISA method, offers great potential and exploration of this area by residue chemists should be encouraged.

This report by Commission VI.5 was published in PAC, Vol.56, pp. 1131–1152 (1984).

---

# IUPAC PUBLICATIONS

## CHEMRAWN II, Chemistry and World Food Supplies: The New Frontiers/Perspectives and Recommendations

This xviii + 169-page paperback volume, edited by Gordon Bixler and L. W. Shemilt contains the summary, conclusions and recommendations from the CHEMRAWN II Conference — Chemistry and World Food Supplies: The New Frontiers — held in Manila, Philippines, 6–10 December 1982. The bulk of the volume is taken up by the nine plenary lectures:

Our greatest challenge — Feeding a hungry world (M. S. Swaminathan).
Economic and social factors influencing the use of chemicals in agriculture (W. D. Hopper).
The future role of Chemistry in removing constraints on food production and utilization (L. von Planta).
Biological constraints on food production and on the level and efficient use of chemical inputs (T. R. Odhiambo).
Physical and chemical constraints to food production in the tropics (P. A. Sanchez, J. J. Nicholaides III and W. Couto).
Basic chemical research and future food supplies (M. Calvin).
Food and energy — Interdependent world needs (G. Porter).
Feeding the world during the next doubling of the world population (N. E. Borlaug).

The concluding remarks — World hunger: Problems and opportunities — were written by B. W. Rossiter, Chairman of the IUPAC CHEMRAWN Committee.

Copies of this booklet may be obtained from American Chemical Society, 1155 Sixteenth Street, N. W., Washington, DC 20036, USA at US$7.50, prepaid by dollar cheque or UNESCO coupons, including postage. ISBN 971–104–105–7. Persons in developing countries may order copies from International Rice Research Institute, P.O. Box 933, Manila, Philippines at US$11.00 air mail or US$3.40 surface mail, prepaid.

Note: A companion 600-page volume — *Chemistry and World Food Supplies: The New Frontiers* — edited by L. W. Shemilt, containing the texts of 56 invited lectures, is available from Pergamon Press. ISBN 0–08–029243–7 (hardcover) US$135; 0–08–029242–9 (flexicover) US$75.

# Electroanalytical methods in clinical chemistry

By Prof. W. C. Purdy
Commission VII.4

Millions of chemical analyses are performed each day in clinical laboratories around the world, making the medical profession the world's largest consumer of analytical services. Along with an increasing number of requests for assays is a demand for more accurate, specific, and sensitive analyses, with answers delivered in 'real time' so they can be useful to the physician.

To cope with these requests analytical chemists and manufacturers have developed new generations of clinical chemistry instruments. Analytical equilibrium methods have been scrapped and procedures based on kinetic measurements adopted. Data acquisition and handling are under computer control so that after sample preparation the 'slow step' in the analysis can often be the transcription of results to the hard-copy record. It is no longer practical, for example, to wait while a sample is consumed in a flame and an atomic emission line intensity is measured, especially when a potential at an ion-selective electrode can give a more reliable answer, in some cases at a cheaper cost per analysis, in a shorter period of time. Furthermore, de Silva and Brooks[1] have pointed out that the detection limits of many electroanalytical techniques rival those of the most sensitive optical methods. Pungor *et al.*[2] have reviewed the wide variety of electroanalytical techniques which may be used for analysis of pharmaceuticals.

Because of the great variety of electroanalytical methods available, it has been decided to limit this discussion to four: coulometry, differential pulse polarography (DPP), ion-selective/enzyme electrodes and liquid chromatography with electrochemical detection (LCED). These will illustrate the wide applicability of electrochemical techniques to clinical chemistry.

## COULOMETRY

Prof. William C. Purdy

Coulometry applies the principles of Faraday's Law to analysis. According to this law, one Faraday of electricity (about 96 500 coulombs) brings about the oxidation or reduction of one chemical equivalent* of material. For the purpose of analysis two criteria must be met: (i) there must be no other substances present in the sample or electrolyte solutions which can undergo electrolysis and (ii) the electrolysis must proceed with 100% current efficiency. If this latter condition is satisfied, the amount of electricity can be related directly to the concentration by Faraday's Law.

In principle there are two types of coulometry, potentiostatic and amperostatic. As the names imply, the former is performed at a constant electrolysis potential whereas in the latter the electrolysis current is held constant. For potentiostatic coulometry the potential of the working (electrolysis) electrode is maintained

*See Appendix to IUPAC *Compendium of Analytical Nomenclature*, 1978 constant by a fast responding potentiostat. A coulometer, connected in series with the electrolysis cell, measures the number of coulombs associated with the electrolysis of the analyte. By using this technique it is possible to measure the oxygen content of blood, respiratory gases and anaesthesia gases[3,4].

The product of electrolysis in amperostatic coulometry is used as a titrant to determine the analyte. The reaction between these two must be stoicheiometric and preferably rapid. The time of electrolysis is measured (the product of current and time yields coulombs) and is related directly to analyte titrated. All types of titrations, acid–base, precipitation, redox and complex-formation, can be carried out coulometrically. A singular advantage of coulometric titrations (amperostatic coulometry) is that an electrical rather than a chemical standard is used. The method is absolute[5] in that it depends only on the fundamental relationship between the Faraday constant and the atomic mass. Thus the technique lends itself admirably to high-precision assay work.

The first application of coulometric titrations to clinical chemistry was made by Cotlove[6] who determined the chloride in 40 $\mu$l of serum by precipitation titration with generated silver(I) ion. Since then the method has been applied to a wide variety of clinical and toxicological analyses, mainly by Purdy and his students[7].

## DIFFERENTIAL PULSE POLAROGRAPHY (DPP)

DC polarography has frequently been overlooked as a tool for routine quantitative analysis of organic compounds in biological matrices. This is due partially to a lack of sensitivity and to the difficulty in separating the faradaic current (related to the electrolysis reaction at the dropping mercury electrode [DME]) from the capacitative current (related to the charging of the double layer around the DME). Many different approaches have been tried for separating these currents. DPP, one of the more useful, employs short duration, small amplitude voltage pulses of constant height on top of a slowly rising DC potential ramp. These pulses are applied near the end of the lifetime of the drop when the surface area of the DME is changing least. A difference is taken between the current sampled immediately before pulse application and again toward the end of the pulse when capacitative currents have decayed. These differences are displayed as a function of applied potential. This results in easily interpretable Gaussian-shaped peaks, the height of which is directly proportional to the concentration of electroactive species in the bulk solution over a concentration range of $10^{-4}$ to $10^{-8}$ M.

Chowdhry[8] has reviewed some of the recent uses of voltammetry in medicine citing the determination of serum albumin. Brooks and coworkers have used DPP for the analysis of drugs in biological fluids and for therapeutic drug monitoring; the nitro derivative of phenobarbital has been determined in whole blood[9] and DPP has been used following TLC separation to determine Librium and its metabolites[10]. Haloperidol, a neuroleptic of the butyrophenone family, and its derivatives have been studied by DC and AC polarography and assayed in the $10^{-4}$ to $10^{-6}$ M concentration range by DPP[11].

If the substance to be determined is a metal which is soluble in mercury, then DPP can be coupled with an initial preconcentration step to give an analytical procedure which has detection limits at least one order of magnitude lower than DPP itself. During the preconcentration step the metal is electrolytically deposited onto a mercury surface. A DPP voltage scan in the positive direction strips the metal from the mercury. Differential pulse anodic stripping voltammetry (DPASV) is currently the most sensitive electroanalytical technique available for the analysis of metals and some applications of this method to the determination of toxic metals have been reviewed[12]. Finally, a recent paper describes a type of DPASV where the preconcentration step is accomplished through adsorption[13]. Chlorpromazine, hexacyanoferrate(II) or ascorbic acid are adsorbed onto a carbon-paste working electrode under conditions which will maximize adsorption. The electrolyte is then changed and the adsorbed material is stripped off anodically. The usefulness of the technique is illustrated by the determination of chlorpromazine in blood and urine.

## ION-SELECTIVE/ENZYME ELECTRODES

Ion-selective electrodes (ISEs) consist of a metal or a metal/metal salt electrode in a solution of an electrolyte separated from a test solution by a permselective membrane. The critical component of the ISE is the membrane, for it determines the sensitivity and selectivity of the electrode. All ISEs measure the activity of ions and follow the Nernst equation

$$E = \text{const.} + \frac{RT}{nF} \ln a_M \qquad (1)$$

where $E$ is the measured electromotive force of the cell, $R$ is the gas constant, $T$ is the temperature in Kelvin, $n$ is the ionic charge, $F$ is the Faraday, and $a_M$ is the activity of the ion being measured. For a mixture of ions, $M^+$ and $M^+$, this equation expands to

$$E = \text{const.} + \frac{RT}{nF} \ln \left(a_{M_1} + Ka_{M_2}\right) \qquad (2)$$

where $K$ is the selectivity factor. This factor is a quantitative, activity-dependent measure of the ability of the ISE to discriminate between ions. Buck[14] has prepared an excellent review of the electrochemistry of ISEs and the reader is referred to this source for a thorough, up-to-date, theoretical discussion.

Examples of the application of ISEs to clinical analyses are so numerous that only a few will be given here. Ladenson and Bowers[15] used commercially available ISEs to measure ionic calcium in human serum and confirmed that magnesium interfered with the calcium reading by lowering the potential[16]. Herman and Rechnitz [17] have described a liquid membrane electrode for the direct, continuous-flow measurement of carbonate ion. The electrode was used to measure the $CO_2$ content of human serum. Finally, Moses *et al.*[18] have developed a continuous-flow analysis of ammonia in blood and plasma using an ammonia-selective electrode.

The new Kodak Ektachem system measures serum electrolytes (Cl, Na, K, $CO_2$) with single-use, thin-film, ISEs by a differential potentiometric technique[19]. The ISE is produced on a multilayer slide and contains all the necessary chemicals for the measurement of a single analyte. In actual operation 10 μl of patient serum and 10 μl of a reference solution are simultaneously deposited on the sample and reference sides of the slide. The slide is then incubated for a fixed period of time before the differential potentiometric measurement is made and the concentration of a single analyte calculated.

Enzyme electrodes, which can be traced to a development by Katz[20], combine the specificity of enzyme methods of analysis with the ease of operation of an ISE. Guilbault *et al.*[21] were the first to immobilize the enzyme in a gel around a cation-selective electrode. Today electrodes can be fabricated to measure either enzyme activity or substrate concentration, depending on the material placed in the gel.

Guilbault and Hrabankova[22] immobilized a layer of L-amino acid oxidase between a layer of cellophane and a cation-selective electrode to produce an electrode selective for L-amino acids. Substitution of D-amino acid oxidase or asparaginase for the L-amino acid oxidase makes the electrode selective for the assay of D-amino acids or asparagine, respectively[23]. β-Glucosidase immobilized on a cyanide-selective electrode has been used for the determination of Amygdalin[24]. Serum cholesterol has been determined by a double enzyme procedure in an automated analysis system[25]. Cholesterol ester is hydrolyzed with cholesterol ester hydrolase and the cholesterol is oxidized in the presence of cholesterol oxidase forming hydrogen peroxide which reacts with iodide to liberate iodine. The final determination is made at an ISE. A creatininase reactor and an ammonia gas sensor have been used for the determination of creatinine in plasma and urine[26].

Some recent studies on enzyme electrodes have employed biocatalytic membranes to achieve selectivity. These membranes have been fashioned from animal and plant tissue. A membrane consisting of mouse small-intestine mucosal cells which contain adenosine deaminase (E.C.3.5.4.4) was coupled with an ammonia gas sensor to make an adenosine-sensing electrode[27]. Using the same principle, squash tissue continuing glutamate decarboxylase on a carbon dioxide gas sensor detected L-glutamic acid[28].

## LIQUID CHROMATOGRAPHY WITH ELECTROCHEMICAL DETECTION

Many methods have been devised to monitor the effluents from reverse-phase LC columns. Electrochemical detectors (EDs) take advantage of the fact that many substances, including biologically-active substances, are capable of electron-transfer reactions. If the potential of a working electrode, over which the analyte flows, is made of sufficient magnitude to cause an oxidation or reduction to take place, then the current associated with that redox reaction is proportional to the concentration of the analyte moving through the detector.

Although a number of electrode materials have been used for the working electrode, the most popular is carbon. Kissinger *et al.*[29] designed an early ED cell with a carbon-paste electrode. A conventional three-electrode potentiostatic system was used to maintain the potential of the working electrode; the auxiliary and Ag/AgCl reference electrodes were located downstream. Essentially the same detector was employed to determine catecholamines after separation on alumina[30] and epinephrine, norepinephrine, L-dopa, α-methyldopa, isoproterenol and phenylephrine separated on Zipax SCX[31]. If an anion exchange column is employed, uric acid and ascorbic acid may be assayed[32].

Glassy carbon working electrodes in a tubular configuration presented a number of practical design problems. It proved almost impossible to match the inner channel of the electrode to the small diameter required to obtain an effective cell volume of $<1\ \mu l$. Also it was very difficult to polish the inner working surface of the electrode to the high gloss necessary to minimize surface adsorption. To overcome these problems Fleet and Little[33] developed a wall-jet electrode detector and used this device to determine mixtures of chloromadinone and estrone. The ED results were compared with those obtained by UV detection.

Others have simply taken the Kissinger design and replaced the carbon paste with glassy carbon. With these detectors phenothiazine, thioxanthene and butyrophenone neuroleptics and antihistamines in plasma have been assayed[34,35], single oral dose concentrations of plasma trimeprazine[36] have been determined as well as the plasma levels of homovanillic acid[37] and of catecholamines[38].

Purdy and his co-workers have designed electrochemical detectors with low temperature isotropic carbon working electrodes[39] and used them for the determination of the thyroid hormones[40,41]. Finally, a comprehensive evaluation of carbon electrodes for continuous-flow detectors has been made[42].

In addition to the use of different carbon materials for the working electrode, certain design modifications have been made in the detector itself. Blank[43] designed a dual-electrode detector that offered two distinct modes of operation. In the in-series mode compounds that overlap chromatographically but have different electrochemical characteristics could be determined separately at the two electrodes if they were poised at different potentials. The detector could also be operated in a parallel-analysis mode, shortening the time for routine analyses. Others[44] have suggested that in the in-series mode the first electrode could be used to remove interferences at potentials where the analyte, which is assayed at the second electrode, would not respond.

A detector design which offers much promise is the parallel-opposed, dual-working-electrode detector. In this detector the two working electrodes are located parallel to one another and are separated by a thin insulating material. For this detector to operate successfully, the analyte must be part of an electrochemically reversible or quasi-reversible redox couple, the electrodes must be held close together and at potentials that are independent of one another. If one electrode is maintained at a potential where oxidation of the analyte takes place and the second electrode is held at a potential where the products of that oxidation are reduced to starting material, then for each conversion that takes place the current will be increased. Weber and Purdy[45] suggested the possibility of using such a system as an HPLC detector and made some predictions of expected behavior based on a mathematical model. McClintock and Purdy[46,47] developed the detector and observed amplifications of up to ten times for the analysis of catecholamines. Clearly a detector of this sort could be useful, especially at the slow flow rates associated with microbore or capillary HPLC.

## CONCLUSIONS

The author has mentioned some of the recent developments in the application of electrochemistry to clinical chemistry. To be sure many other examples exist that are not mentioned here. However, those that are included illustrate the efficacy of electrochemical answers to these clinical chemistry problems. Furthermore, some of the techniques discussed are applicable to kinetic analyses, the wave of the present.

## REFERENCES

1. J. A. F. de Silva and M. A. Brooks (1978) Voltammetric methods in *Drug Fate and Metabolism (Methods and Techniques)*, Vol. 2, (Eds. E. R. Garrett and J. L. Hirtz), Marcel Dekker, New York, Chap. I.
2. E. Pungor, Zs. Fehér, G. Nagy, E. Lindner and K. Tóth (1982) Trends in the application of electroanalytical techniques to the analytical control of pharmaceuticals. *Anal. Proc.* **19,** 79.
3. P. A. Hersch (1952) Galvanic determination of traces of oxygen in gases. *Nature* **169,** 792.
4. P. A. Hersch (1976) Couloximetry in the clinical laboratory in *Microtechniques for the Clinical Laboratory: Concepts and Applications,* (Ed. M. Werner), Wiley, New York, Chap. XI.
5. E. Bishop (1975) in *Comprehensive Analytical Chemistry,* Vol. 2D, (Eds. C. L. Wilson and D. W. Wilson), Elsevier, Amsterdam, p. 24.
6. E. Cotlove (1961) Chloride in *Standard Methods of Clinical Chemistry,* Vol. 3, (Ed. D. Seligson), Academic Press, New York, pp. 81–92.
7. W. C. Purdy (1977) Coulometry in clinical chemistry. *CRC Crit. Revs. in Clin. Lab. Sci.* **7,** 227.

8. B. Z. Chowdhry (1976) Some recent applications of voltammetry to medicine. *Proc. Anal. Div. Chem. Soc.* **13,** 235.
9. M. A. Brooks, J. A. F. de Silva, and M. R. Hackman (1973) The determination of phenobarbital and diphenylhydantoin in blood by differential pulse polarography. *Anal. Chim. Acta* **64,** 165.
10. M. R. Hackman, M. A. Brooks and J. A. F. de Silva (1974) Determination of chlordiazepoxide hydrochloride (Librium) and its major metabolites in plasma by differential pulse polarography. *Anal. Chem.* **46,** 1075.
11. J.-C. Vire, M. Fischer, G. J. Patriarche and G. D. Christian (1981) Electrochemical behavior of some neuroleptics: Haloperidol and its derivatives. *Talanta* **28,** 313.
12. W. C. Purdy (1983) Electrochemical detection of toxic metals in biological materials in *Chemical Toxicology and Clinical Chemistry of Metals,* (Eds. S. S. Brown and J. Savory), Academic Press, London, pp. 17–30.
13. J. Wang and B. A. Freiha (1983) Differential pulse voltammetry with medium-exchange for analytes strongly adsorbed on electrode surfaces. *Anal. Chim. Acta* **148,** 79.
14. R. P. Buck (1981) Electrochemistry of ion-selective electrodes. *Sensors and Actuators* **1,** 197.
15. J. H. Ladenson and G. N. Bowers, Jr. (1973) Free calcium in serum. I. Determination with the ion-specific electrode, and factors affecting the results. *Clin. Chem.* **19,** 565.
16. T.-K. Li and J. T. Piechocki (1971) Determination of serum ionic calcium with an ion-selective electrode: evaluation of methodology and normal values. *Clin. Chem.* **17,** 411.
17. H. B. Herman and A. G. Rechnitz (1975) Serum carbon dioxide determination using a carbonate ion-selective membrane electrode. *Anal. Lett.* **8,** 147.
18. G. C. Moses, R. J. Thibert, and T. F. Draisey (1978) Continuous-flow analysis of ammonia in perchloric acid supernate of blood or plasma using an ammonia-selective electrode. *J. Clin. Path.* **31,** 1207.
19. P. N. Schnipelsky, C. P. Glover, R. F. Jakubowicz, and D. E. Larson (1979) Experimental automated and compact instrumentation to measure serum electrolytes with single-use, thin-film electrodes. *Clin. Chem.* **25,** 1115.
20. S. A. Katz (1964) Direct potentiometric determination of urease activity. *Anal. Chem.* **36,** 2500.
21. G. G. Guilbault, R. K. Smith, and J. G. Montalvo, Jr. (1969) Use of ion-selective electrodes in enzymic analysis. Cation electrodes for deaminase enzyme systems. *Anal. Chem.* **41,** 600.
22. G. G. Guilbault and E. Hrabankova (1970) An L-amino acid electrode. *Anal. Lett.* **3,** 53.
23. G. G. Guilbault and E. Hrabankova (1971) New enzyme electrode probes for D-amino acids and asparagine. *Anal. Chim. Acta* **56,** 285.
24. R. A. Llenado and G. A. Rechnitz (1971) Improved enzyme electrode for Amygdalin. *Anal. Chem.* **43,** 1457.
25. D. S. Papastathopoulos and G. A. Rechnitz (1975) Enzymatic cholesterol determination using ion-selective membrane electrodes. *Anal. Chem.* **47,** 1792.
26. M. Mascini, G. Palleschi, D. D'Ottavio, and G. Mazzella (1983) Creatinine determination in plasma and urine by use of a creatininase reactor and an ammonia sensor probe. *Anal. Chim.* **73,** 29.
27. M. A. Arnold and G. A. Rechnitz (1981) Selectivity enhancement of a tissue-based adenosine-sensing membrane electrode. *Anal. Chem.* **53,** 515.
28. S. Kuriyama and G. A. Rechnitz (1981) Plant tissue-based bioselective membrane electrode for glutamate. *Anal. Chim. Acta* **131,** 91.
29. P. T. Kissinger, C. Refshauge, R. Dreiling, and R. N. Adams (1973) An electrochemical detector for liquid chromatography with picogram sensitivity. *Anal. Lett.* **6,** 465.
30. C. Refshauge, P. T. Kissinger, R. Dreiling, L. Blank, R. Freeman, and R. N. Adams (1974) New high performance liquid chromatographic analysis of brain catecholamines. *Life Sci.* **14,** 311.
31. R. M. Riggin. L.-d. Rau, R. L. Alcorn, and P. T. Kissinger (1974) Determination of phenolic sympathetic stimulants in pharmaceutics by liquid chromatography with electrochemical detection. *Anal. Lett.* **7,** 791.
32. P. T. Kissinger, L. J. Felice, R. M. Riggin, L. A. Pachla, and D. C. Wenke (1974) Electrochemical detection of selected organic components in the eluate from high performance liquid chromatography. *Clin. Chem.* **20,** 992.
33. B. Fleet and C. J. Little (1974) Design and evaluation of electrochemical detectors for HPLC. *J. Chromatogr. Sci.* **12,** 747.
34. S. H. Curry, E. A. Brown, and J. H. Perrin (1981) HPLC assay of phenothiazine, thioxanthene and butyrophenone neuroleptics and antihistamines in plasma: II. Radical compression columns and electrochemical detection. *IRCS Med. Sci.* **9,** 168.
35. S. H. Curry and E. A. Brown (1981) HPLC assay of phenothiazine, thioxanthene and butyrophenone neuroleptics and antihistamines in plasma: III. Quantitative aspects and clinical data. *IRCS Med. Sci.* **9,** 170.
36. G. McKay, J. K. Cooper, K. K. Midha, K. Hall, and E. M. Hawes (1982) Simple and sensitive high-performance liquid chromatographic procedure with electrochemical detection for the determination of plasma concentrations of trimeprazine following single oral doses. *J. Chromatogr.* **233,** 417.
37. W.-H. Chang, M. Scheinin, R. S. Burns, and M. Linnoila (1983) Rapid and simple determination of homovanillic acid in plasma using high performance liquid chromatography with electrochemical detection. *Acta pharm. toxicol.* **53,** 275.
38. R. C. Causon, M. J. Brown, P. M. Boulous, and D. Perret (1983) Analytical differences in measurement of plasma catecholamines. *Clin. Chem.* **29,** 735.
39. B. R. Hepler, S. G. Weber, and W. C. Purdy (1980) The amperometric detection of thyroid hormones following reverse phase high pressure liquid chromatography. *Anal. Chim. Acta* **113,** 269.
40. B. R. Hepler, S. G. Weber, and W. C. Purdy (1982) Liquid chromatographic separation of the thyroid hormones. *Anal. Chim. Acta* **138,** 221.
41. B. R. Hepler and W. C. Purdy (1983) Use of a dual coulometric-amperometric detection cell approach in thyroid hormone assay. *J. Liq. Chromatogr.* **6,** 2275.
42. D. J. Chesney, J. L. Anderson, D. E. Weisshaar, and D. E. Tallman (1981) Evaluation of Kel-F-graphite electrodes as detectors for continuous flow systems. *Anal. Chim. Acta* **124,** 321.
43. C. L. Blank (1976) Dual electrochemical detector for liquid chromatography. *J. Chromatogr.* **117,** 35.
44. D. A. Roston, R. E. Shoup, and P. T. Kissinger (1982) Liquid chromatography-electrochemistry: thin-layer multiple electrode detection. *Anal. Chem.* **54,** 1417A.

45. S. G. Weber and W. C. Purdy (1982) Electrochemical detection with a regenerative flow cell in liquid chromatography. *Anal. Chem.* **54,** 1757.
46. S. A. McClintock and W. C. Purdy (1981) A bipotentiostat for four-electrode electrochemical detectors. *Anal. Lett.* **14,** 791.
47. S. A. McClintock and W. S. Purdy (1983) Dual working electrode electrochemical detector for liquid chromatography, *Anal. Chim. Acta* **148,** 127.

---

# OTHER PEOPLE'S PUBLICATIONS

## Federation of Asian Chemical Societies (FACS)

**FACS Newsletter No. 1/1984, February 1984.** Recommendations of IOCD Panel on programmes for chemistry in Asia. Paper by Dr. K. V. Sane (formerly IUPAC/CTC) on locally produced low-cost equipment and experiments for chemistry teaching. UNESCO Regional Networks in Chemistry in Asia. Brief history of the Chinese Chemical Society, Beijing. Article on Chemistry and the environment. Summary of a report — *Cleaning Our Environment: A Chemical Perspective.* A brief description of the Chinese Chemical Society located in Taipei.

## Groupement pour l'Avancement des Methodes Spectroscopiques et Physicochimiques d'Analyse (GAMS)

**GAMS Information Bulletin No. 84, March–April 1984.** Editorial on the services available through GAMS. List of papers to be given at a two-day meeting on current analytical instruments.

## International Association of Cereal Chemistry (ICC)

**ICC Newsletter No. 2/March 1984**: Objectives and activities of the ICC Study Groups on: Sorghum, the millets, grain legumes and composite flour; The condition of grain in storage; Infrared techniques. Announcements of meetings: 11th ICC Congress, Vienna, June 1984; New Approaches to Research on Cereal Carbohydrates, Copenhagen, June 1984; Analyses as Practical Tools in the Cereal Field, Norway, May 1985.

## International Council of Scientific Unions (ICSU)

**ICSU Newsletter No. 16, December 1983**: Plans for the three scientific symposia to be held during the 20th ICSU General Assembly — Symposium on Global Change, Symposium on the Teaching of Science, Symposium on Biotechnology. Report on 7th International Conference on Chemical Education (see CI, 1984, No. 2, pp. 39–41). Brief outline of CHEMRAWN III programme. Report on relevant sessions of the 22nd General Conference of UNESCO. Report on the annual meeting of the Steering Committee of the International Biosciences Networks. Article on Distinguished Lectureships in Science. Report on the 27th Regular Session of the General Conference of the International Atomic Energy Agency. Article on the International Union of Microbiological Societies (IUMS).

## ICSU Committee on Data for Science and Technology (CODATA)

**CODATA Newsletter No. 28, April 1984**: Programme of the 9th International CODATA Conference, June 1984. Notes on CODATA Working Group on Critically Evaluated Phase-Equilibrium Data, CODATA Task Group on Thermophysical Properties of Solids, summer school, Poland, August 1985, on thermodynamic data prediction and evaluation, relative costs of data base searches from European and US hosts.

## International Federation of Clinical Chemistry (IFCC)

**IFCC News No. 36, 1984/1.** Continuation of the series of reports on the Workshop on 'A small laboratory' — in this issue consideration is given to the design, use, maintenance and performance monitoring of instruments. Shortened version of *A review of visual aids in teaching* (CI, 1984, No. 2, pp. 24–31). Objectives of IUPAC Clinical Chemistry Division. Current and future activities of IFCC Education Committee (IUPAC Commission VII.3). Meetings diary, 1984–1985.

## International Union of Pure and Applied Biophysics (IUPAB)

**IUPAB News, May 1984.** Documents for the meetings of the IUPAB Council and General Assembly in Bristol, UK, July/August 1984. Additions to calendar of IUPAB-sponsored meetings 1984.

# SOCIEDAD QUÍMICA DEL PERÚ

As anticipated in CI, 1983, No. 2, p. 23, the Latin-American Congress of Chemical Sciences took place in Lima, Peru, 17–22 October 1983, to commemorate the 50th anniversary of the foundation of the Chemical Society of Peru. At a ceremony in honour of the founders of the Society, presided over by Dr. Gastón Pons Muzzo, Rector of the University of San Marcos, a scroll (as illustrated) was presented on behalf of IUPAC.

The President of the Republic of Peru, Arq. Fernando Belaúnde Terry, presided over the inaugural ceremony of the actual Congress at which he greeted and congratulated the President of the Chemical Society of Peru, Dr. Juan de Dios Guevara, on the 50th anniversary of the Society.

**Right: The IUPAC scroll presented to the Chemical Society of Peru**

THE INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY
presents its warm congratulations
to
SOCIEDAD QUÍMICA DEL PERÚ
on the occasion of the
50th Anniversary of its Foundation

Chemistry is undoubtedly a very international branch of science because all chemists throughout the world work inevitably with the same chemical compounds and reactions.

Peru is one of the countries which is remote from the main streams of personal contacts and exchanges between chemists. It was therefore very important that, 50 years ago, the Chemical Society of Peru was formed in order to offer possibilities of mutual exchange of ideas and experiences within your country and abroad.

The Society reached within the last five decades an eminent place among learned societies of the world dedicated to the advancement of science and contributing to the general welfare of human life.

IUPAC is pleased to help the Society to narrow the geographical gap between Peru and the rest of the world. It presents its best wishes for the continued future success of the Chemical Society of Peru.

W. G. SCHNEIDER
President

October 1983

**Arq. Fernando Belaúnde Terry congratulates Dr. Juan de Dios Guevara**

# IUPAC Report to International Council of Scientific Unions 1983

The main event for IUPAC in 1983 was its 32nd General Assembly, which was held in Lyngby, Denmark, at the end of August. Delegates from 40 of the 45 National Adhering Organizations were in attendance. An account of the deliberations is given in *Chemistry International* (Supplement 1984 and Nos. 5 and 6, 1983; Nos. 1 and 2, 1984).

IUPAC Officers for the period 1983–1985 are:

*President* — Dr. W. G. Schneider (Canada)
*Vice-President* — Prof. C. N. R. Rao (India)
*Secretary General* — Prof. T. S. West (UK)
*Treasurer* — Prof. A. Björkman (Denmark)

An application for membership of IUPAC (to commence in 1984) by Sociedad Química del Perú was accepted. European Federation of Corrosion, International Organization for Biotechnology and Bioengineering, and International Zeolite Association were admitted to Associated Organization status of the Union. In addition to Chemical Society of Thailand, which joined the previous year, there were five more Observer Countries: Sociedad Chilena de Química, Hong Kong Chemical Society, Nepal Chemical Society, Sociedad Química del Perú, and Singapore National Institute of Chemistry.

The International Meeting of Chemical Society Presidents was held in Copenhagen immediately after the IUPAC General Assembly, and the Presidents were invited to attend the Council deliberations. Detailed proposals were accepted for a self-financing Affiliate Membership Scheme, through which individual chemists all over the world may become involved voluntarily in their international scientific union. However, the launch of the Scheme was delayed. It was decided not to allow funds to be diverted from other activities within the Union or from reserves, and the seed money would therefore be sought from outside IUPAC.

The Vice-President presented the first statutory, biennial critical assessment of IUPAC projects and programmes, as a result of which the Commissions on Physicochemical Measurements and Standards and on reclamation of Solid Wastes were dissolved. The Commissions on Medicinal Chemistry, on analytical Radiochemistry and Nuclear Materials, on Atmospheric Environment, and on Water Quality, suspended in 1981 remain so, awaiting suitable proposals to re-establish their activities. A new Commission on Chemical Kinetics was created, and all other Commissions were allowed to continue for the next two years. Statutory provision will be tabled in 1985 to limit the total period of service for an individual on various IUPAC bodies. The intention is to encourage wider participation of chemists, especially younger persons, in the scientific work of IUPAC.

The role which IUPAC plays in helping to harness and direct chemistry for the benefit of mankind in general was continued through the recommendations of the influential CHEMRAWN series of conferences. Satisfactory progress was achieved in the arrangements for CHEMRAWN III: 'Resource Material Conversion — (Bio-)Chemical Process Bridges to meet Future Needs' (Den Haag, Netherlands: 25–29 June 1984) and progress was escalating for CHEMRAWN IV: 'Chemical Resources of the Global Oceans' (Woods Hole/Massachusetts, USA: 22–28 September 1984). CHEMRAWN V, tentatively entitled 'Contributions of Chemistry to Human Health: the New Frontiers', is likely to be held in FRG during 1986.

Reactions to the experimental changes in emphasis of the contents of the IUPAC news magazine, *Chemistry International*, were very satisfactory and a motion asking Council for discontinuation of CI, based on the old-style contents, was withdrawn. When the present part-time editor can be replaced by a full-time person, even more effort will be paid to presentation of IUPAC news and of IUPAC-related material in a readable and interesting format. Meanwhile, CI now enables all within and outside the Union to be well informed of exactly what is going on throughout IUPAC.

Alternative criteria to chemical turnover, such as chemical publications, were examined as the basis of IUPAC dues, but showed no overall advantage. The dues structure approved at Leuven (1981) was therefore revised and Council accepted the introduction for 1984 of a mathematical formula, relating national subscription to chemical turnover and the total national subscription income required by the Union in the year. This should make it easier for National Adhering Organizations to justify the provision of funds to meet national dues. Notification was given of a proposal to smooth out the voting system, which presently allocates 6, 4, 2 and 1 votes to national delegations, by the introduction of 5- and 3-vote categories.

A proposal to create 'IUPAC Seminars' was accepted by Council, in principle, and a study group will be asked to look in detail into the matter and to report back to the Bureau. A series of such seminars is suggested to stimulate international cooperation within geographical regions, particularly in areas where geographical, financial or organizational factors make exchanges of scientific ideas more difficult than elsewhere. A report was received by the Bureau, summarizing consultations with a number of individuals and organizations involved with a variety of computerized data bases. The recommendations were accepted, especially that an Advisory Committee on Chemical Data Bases should be created to formulate urgently a general policy for the Union on this increasingly important matter.

Further progress was made in implementing recommendations for reorganization and rationaliziation of the work of the IUPAC Secretariat. An AES 7200 word processor system was installed towards the end of the year and a start made in using it to compile *Membership Lists of IUPAC Bodies 1983–1985*. A new telephone system, with answering machine to record messages when the office is closed, had also been installed.

The fifth biennial listing of Current Programmes of IUPAC, published in May 1983, gives details of the considerable number of important on-going activities of the Union.

The following recommendations on nomenclature and symbols were published in 1983:

1. Revision of the Extended Hantzsch-Widman system of nomenclature for heteromonocycles *(Recommendations 1982)*, *Pure Appl. Chem.* **55,** 409–416 (1983) — Commission on Nomenclature of Organic Chemistry
2. Nomenclature of retinoids *(Provisional)*, *Pure Appl. Chem.* **55,** 721–726 (1983) – IUPAC-IUB Joint Commission on Biochemical Nomenclature
3. Definitions, terminology and symbols in colloid and surface chemistry. Part 1.14: Light scattering *(Provisional)*, *Pure Appl. Chem.* **55,** 931–941 (1983) — Commission on Colloid and Surface Chemistry Including Catalysis
4. Recommended notation for use in the description of biological wastewater treatment processes *(Provisional)*, *Pure Appl. Chem.* **55,** 1035–1040 (1983) — Commission on Water Quality
5. Characteristics and attributes of instruments intended for automated analysis in clinical chemistry *(Recommendations 1982)*, *Pure Appl. Chem.* **55,** 1041–1048 (1983) — Commission on Automation and Clinical Chemical Techniques
6. Interphases in systems of conducting phases *(Provisional)*, *Pure Appl. Chem.* **55,** 1251–1268 (1983) — Commission on Electrochemistry
7. Symbols for specifying the conformation of polysaccharide chains *(Provisional)*, *Pure Appl. Chem.* **55,** 1269–1272 (1983) — IUPAC-IUB Joint Commission on Biochemical Nomenclature
8. Abbreviations and symbols for the description of conformations of polynucleotide chains *(Provisional)*, *Pure Appl. Chem.* **55,** 1273–1280 (1983) — IUPAC-IUB Joint Commission on Bio-Chemical Nomenclature
9. Glossary of terms used in physical organic chemistry *(Recommendations 1982)*, *Pure Appl. Chem.* **55,** 1281–1371 (1983) — Commission on Physical Organic Chemistry
10. Extension of Rules A-1.1 and A-2.5 concerning numerical terms used in organic chemical nomenclature *(Provisional)*, *Pure Appl. Chem.* **55,** 1463–1466 (1983) — Commission on Nomenclature of Organic Chemistry
11. Definition of pH scales, standard reference values, measurement of pH and related terminology *(Provisional)*, *Pure Appl. Chem.* **55,** 1467–1476 (1983) — Commissions on Electroanalytical Chemistry and Electrochemistry
12. Nomenclature, symbols and units recommended for *in situ* microanalysis *(Provisional)*, *Pure Appl. Chem.* **55,** 2023–2027 (1983) — Commission on Microchemical Techniques and Trace Analysis

The following technical reports by IUPAC bodies were published during the year:

1. Influence of acrylic processing aids on the rheology and structure of polyvinyl chloride, *Pure Appl. Chem.* **55,** 177–190 (1983) — Commission on Polymer Characterization and Properties
2. Recommendations for the usage of selective, selectivity and related terms in analytical chemistry, *Pure Appl. Chem.* **55,** 553–556 (1983) — Commission on Analytical Reactions and Reagents
3. A scheme for a two year postgraduate course in clinical chemistry, *Pure Appl. Chem.* **55,** 557-564 (1983) — Commission on Teaching of Clinical Chemistry
4. An annotated bibliography on accuracy in measurement, *Pure Appl. Chem.* **55,** 907–930 (1983) — Commission on Physicochemical Measurements and Standards
5. A collaborative study on the relation between film blowing performance and rheological properties of two low-density and two high-density polyethylene samples, *Pure Appl. Chem.* **55,** 943-976 (1983) — Commission on Polymer Characterization and Properties
6. Thermodynamic functions of transfer of single ions from water to nonaqueous and mixed solvents: Part 1 — Gibbs Free Energies of transfer to nonaqueous solvents, *Pure Appl. Chem.* **55,** 977–1021 (1983) — Commission on Electroanalytical Chemistry
7. Proposal of methods for the determination of vinyl chloride and benzene in workplace atmospheres, *Pure Appl. Chem.* **55,** 1023–1034 (1983) — Commission on Atmospheric Environment
8. Atomic weights of the elements 1981, *Pure Appl. Chem.* **55,** 1101–1118 (1983) — Commission on Atomic Weights and Isotopic Abundances
9. Isotopic compositions of the elements 1981, *Pure Appl. Chem.* **55,** 1119–1136 (1983) — Commission on Atomic Weights and Isotopic Abundances
10. Compleximetric indicators: Characteristics and applications, *Pure Appl. Chem.* **55,** 1137-1230 (1983) — Commission on Analytical Reactions and Reagents
11. Methods for the determination of fissile and fertile elements: Basic data of interest for the spectrophotometric determination of thorium, *Pure Appl. Chem.* **55,** 1231–1238 (1983) — Commission on Analytical Radiochemistry and Nuclear Materials
12. Generating test gases for calibration of methods used in environmental analysis, *Pure Appl. Chem.* **55,** 1239-1250 (1983) — Commission on Atmospheric Environment
13. Half-wave potentials of electroactive substances in hexamethylphosphoric triamide, *Pure Appl. Chem.* **55,** 1373–1380 (1983) — Commission on Electroanalytical Chemistry
14. Results of a collaborative study on determination of polar compounds in frying fats, *Pure Appl. Chem.* **55,** 1381–1385 (1983) — Commission on Oils, Fats and Derivatives
15. Critical survey of stability constants of complexes of indium, *Pure Appl. Chem.* **55,** 1477–1528 (1983) — Commission on Equilibrium Data

16. Applications of ion-selective electrodes in non-aqueous and mixed solvents, *Pure Appl. Chem.* **55**, 2029–2065 (1983) — Commission on Electroanalytical Chemistry
17. Recommended method for the gas chromatographic profile analysis of basic N-containing aromatic components (azaarenes) in high protein foods, *Pure Appl. Chem.* **55**, 2067–2071 (1983) — Commission on Food Chemistry.
18. CHEMRAWN II: Chemistry and world food supplies — Perspectives and recommendations, American Chemical Society (International Activities Office), 1983
19. A laboratory manual for low-budget teaching of chemistry — Vol. I: Low-cost instrumentation based on operational amplifiers for potentiometry and conductometry with illustrative experiments, UNESCO, 1983 — Committee on Teaching of Chemistry
20. Solubility Data Series — Volume 12: Sulfur dioxide, chlorine, fluorine and chlorine oxides (published in book form by Pergamon Press, Oxford, 1983) — Commission on Solubility Data
21. Solubility Data Series — Volume 13: Scandium, yttrium, lanthanum and lanthanide nitrates (published in book form by Pergamon Press, Oxford, 1983) — Commission on Solubility Data
22. Solubility Data Series — Volume 14: Alkaline earth metal halates (published in book form by Pergamon Press, Oxford, 1983) — Commission on Solubility Data

Twenty-two symposia were sponsored by IUPAC in 1983, namely:

1. International Conference on Oils, Fats and Waxes, Auckland/New Zealand, February
2. 29th IUPAC Congress, Cologne/FRG, June (proceedings published by Pergamon Press, Oxford, 1984)
3. 1st International Conference on Bioinorganic Chemistry, Florence/Italy, June (*Pure Appl. Chem.* **55**, 1049–1100 (1983))
4. 2nd International Conference on Science and Technology of Zirconia, Stuttgart/FRG, June (proceedings to be published by American Ceramic Society in *Advances in Ceramics* 1984)
5. 23rd Colloquium Spectroscopicum Internationale, Amsterdam/Netherlands, June–July (*Spectrochimica Acta,* **38**, (11/12) 1373–1568 (1983))
6. International Symposium on Boron Chemistry — IMEBORON V, Swansea/UK, July (*Pure Appl. Chem.* **55**, 1387–1461 (1983))
7. 24th Microsymposium on Macromolecules 'Copolymers: Structure and Solution Properties', Prague/Czechoslovakia, July (*Pure Appl. Chem.* **55**, 1529–1581 (1983))
8. 25th Microsymposium on Macromolecules 'Processing and Long-Term Stabilities of Hydrocarbon Polymers', Prague/Czechoslovakia, July (*Pure Appl. Chem.* **55**, 1585–1668 (1983))
9. SAC 83, Edinburgh/UK, July (Selected papers published in *The Analyst*, (1984))
10. 2nd International Symposium on Clinical Chemistry and Chemical Toxicology of Metals, Montreal/Canada, July (proceedings published by Academic Press, London, 1984)
11. 6th International Symposium on Plasma Chemistry, Montreal/Canada, July (*Pure Appl. Chem.* **56**, 175–230 (1984))
12. 7th International Conference on Chemical Education, Montpellier/France, August (proceedings to be published by the organizers)
13. 9th International Congress of Heterocyclic Chemistry, Tokyo/Japan, August (proceedings to be published as a supplement to *Journal of Heterocyclic Chemistry*)
14. 2nd International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis, Dijon/France, August–September (*Pure Appl. Chem.* **55**, 1669–1859 (1983))
15. 9th International Symposium on Microchemical Techniques (Microchemical Techniques and Trace-analysis), Amsterdam/Netherlands, August-September (*Pure Appl. Chem.* **55**, 1861–2022 (1983))
16. 6th International Symposium on Cationic Polymerization and Related Processes, Ghent/Belgium, August–September (proceedings to be published by Academic Press, London, 1984)
17. International Conference on Fourier Transform Spectroscopy, Durham/UK, September (Proceedings to be published by Pergamon Press, Oxford, 1984)
18. 29th International Symposium on Macromolecules, Bucharest/Romania, September (*Pure Appl. Chem.* **56**, 305–460 (1984))
19. International Conference on Phosphorus Chemistry, Nice/France, September (proceedings published by Gordon & Breach, New York, 1984)
20. 7th International Conference on Crystal Growth, Stuttgart/FRG, September (proceedings published as a special issue of *J. Crystal Growth*, 1984)
21. International Conference on Applications of the Mossbauer Effect, Alma Ata/USSR, September–October (proceedings to be published by the organizers, 1984)
22. 11th International Conference on Organometallic Chemistry, Pine Mountain, Georgia/USA, October (*Pure Appl. Chem.* **56**, 1–173 (1984))

## Absent-minded or . . .

The class of undergraduates became extremely attentive when the lecturer announced that he was going to devote 2–3 lectures on developing the structure of glucose — the forecast was that this topic was hot favourite for the examination that year. Notes were carefully taken in pin-drop silence as the lecturer went on, step by step, starting from the molecular formula. Students had realized the thoroughness with which the lecture was delivered — dealing only with formulae and reactions and treating the compound as if it was unknown. The following day, at the start of the second lecture on the topic, the lecturer asked the class to correct one single mistake. It was fructose he had been dealing with.

# THE ISRAEL CHEMICAL SOCIETY

The Israel Chemical Society celebrated its 50th anniversary by holding a meeting at the Hebrew University of Jerusalem, 10–12 April 1984. A commemorative scroll was presented to Dr. Haim Levanon on behalf of IUPAC by Dr. Ursula Hofacker (GDCh). A Conference medal, issued by the Society to celebrate the occasion, has been received at the IUPAC Secretariat.

A short review of the history and functions of the Israel Chemical Society, prepared by Prof. Shalom Sarel, is reproduced below.

**The Israeli Chemical Society Anniversary Medal**

The Chemists Association in Eretz-Israel was founded in 1933 at a national gathering held in Tel Aviv in the presence of lecturers from the Hebrew University of Jerusalem and the Technion in Haifa, chemists and chemical engineers from the Potash Chemical Works and individuals. It nominated Prof. Chaim Weizman as honorary President and Prof. M. Bobtelsky as Chairman of the Executive Committee. The Association was a decentralized organization, having at first three independent local branches of Jerusalem, Tel Aviv and Haifa. After the foundation, in 1934, of the Daniel-Sieff Research Institute of Rehovot, a fourth local branch in Rehovot joined.

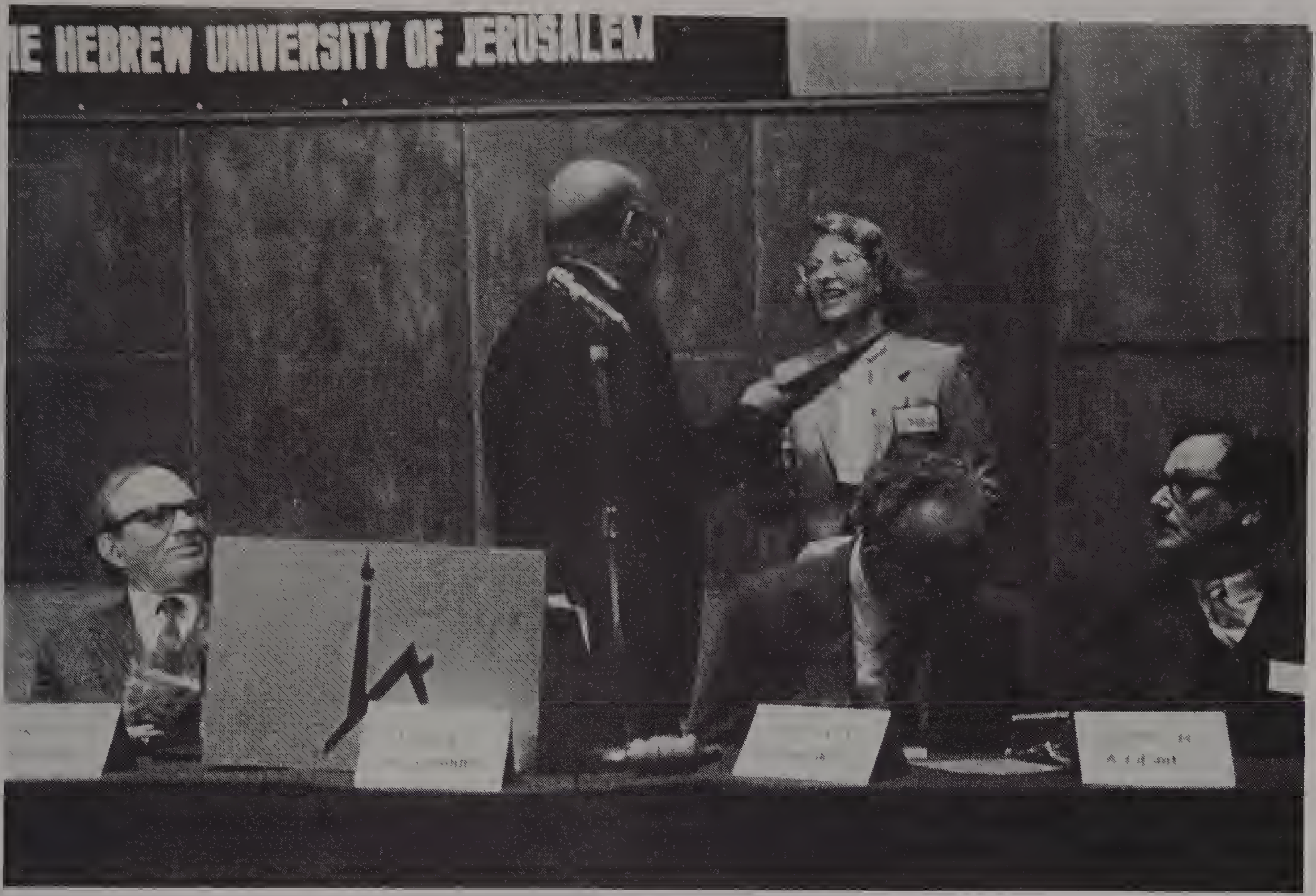
The year 1933 was of special historical importance owing to the rising of the National Socialist (Nazi) Party to power in Germany and, as a consequence, the exodus of numbers of prominent Jews from Germany into Palestine, then an underdeveloped country. Among them were many chemists and qualified technologists who had great difficulty in finding suitable jobs.

The aims and the achievements of the Association in the years 1933–1948 were two-fold: (i) the advancement of chemistry as a scientific endeavour, and (ii) aiding the chemists as a professional group within a society in the making. Accordingly, its main functions comprised: (a) the organization of annual meetings; (b) finding jobs for needy chemists fleeing from the Nazis; (c) providing laboratory facilities for creative persons (refugees) working on their own; (d) representing the chemical profession at national levels.

After the establishment of the State of Israel in 1948, the Association became the National Adhering Organization to IUPAC. In 1962 the Association ceased to exist, being replaced by a new body with a new status and by-laws and with the name The Israel Chemical Society. The Society has an office in Tel Aviv. Its present President is Dr. Ralph Haber, from the "Abic" Pharmaceutical Company, who is aided by an elected Executive Committee, The society is a member of the National Committee on Chemistry recently founded by the Israel Academy on Sciences and Humanities. It has a joint committee with the Academy of The Hebrew Language on chemical nomenclature in Hebrew. Essentially, it adopts IUPAC rules for use in the Hebrew chemical language. The Society plays a prominent role in the editorship of the *Israel Journal of Chemistry* and it holds joint meetings with the Israel Association of Chemical Engineering and the Israel Biochemical Society. It also organizes or sponsors national and international chemical meetings held in Israel and is associated with the Federation of European Chemical Societies.

Sections operating within its framework are: 1. Analytical chemistry; 2. Thermoanalysis; 3. Chemical education; 4. Medicinal chemistry.

It is estimated that there are more than one thousand chemists in Israel.


E HEBREW UNIVERSITY OF JERUSALEM

**Dr. H. Levanon receives the IUPAC scroll at the 50th Anniversary Meeting of the Israel Chemical Society**

# INTERNATIONAL STANDARDS

You may remember that a list of chemically-oriented ISO Standards issued during 1983 was published in CI, 1984, No. 2, pp. 33–35. It was not known whether publication of such lists was a useful function for CI and comments were invited; at the time of writing it still isn't known, so we publish below a continuation of the 1983 list to complete the chemical picture. As before the prefix 'ISO' has been omitted from the Standard number and, again as before, no classifying or grouping has been attempted.

| | |
|---|---|
| 426/1–1983 | Wrought copper-zinc alloys — Chemical composition and forms of wrought products — Part 1: Non-leaded and special copper-zinc alloys |
| 426/2–1983 | Wrought copper-zinc alloys — Chemical composition and forms of wrought products — Part 2: Leaded copper-zinc alloys |
| 430–1983 | Wrought copper-nickel-zinc alloys — Chemical composition and forms of wrought products |
| 5069/1–1983 | Brown coals and lignites — Principles of sampling — Part 1: Sampling for determination of moisture content and for general analysis |
| 660–1983 | Animal and vegetable fats and oils — Determination of acid value and of acidity |
| 6464–1983 | Animal and vegetable fats and oils — Determination of gallates content — Molecular absorption spectrometric method |
| 6490/2–1983 | Animal feeding stuffs — Determination of calcium content — Part 2: Atomic absorption spectrometric method |
| 6560–1983 | Fruit and vegetable products — Determination of benzoic acid content (benzoic acid contents greater than 200 mg per litre or per kilogram) — Molecular absorption spectrometric method |

| | |
|---|---|
| 6561–1983 | Fruits, vegetables and derived products — Determination of cadmium content — Flameless atomic spectrometric method |
| 6636/3–1983 | Fruit and vegetable products — Determination of zinc content — Part 3: Dithizone spectrometric method |
| 7238–1983 | Butter — Determination of pH of the serum — Potentiometric method |
| 125–1983 | Rubber latex, natural — Determination of alkalinity |
| 6225/2–1983 | Rubber, raw, natural — Determination of castor oil content — Part 2: Determination of total ricinoleic acid content — Gas chromatographic method |
| 6528/2–1983 | Rubber — Determination of total sulfur content — Part 2: Sodium peroxide fusion method |
| 918–1983 | Volatile organic liquids for industrial use — Determination of distillation characteristics |
| 1386–1983 | Solvent acetates for industrial use — Methods of test |
| 1897/13–1983 | Phenol, *o*-cresol, *m*-cresol, *p*-cresol, cresylic acid and xylenols for industrial use — Methods of test — Part 13: Determination of residue on distillation (Cresylic acid and xylenols only) |
| 6795–1983 | Phthalic and adipic esters for industrial use — Determination of free alcohols content — Spectrometric method |
| 1271–1983 | Essential oils — Determination of carbonyl value — Free Hydroxylamine method |
| 2599–1983 | Iron ores — Determination of phosphorus content — Titrimetric method |
| 5318–1983 | Fertilizers — Determination of potassium content — Potassium tetraphenylborate gravimetric method (Reference method) |
| 4220–1983 | Ambient air — Determination of a gaseous acid air pollution index — Titrimetric method with indicator or potentiometric end-point detection |
| 5069/2–1983 | Brown coals and lignites — Principles of sampling — Part 2: Sample preparation for determination of moisture content and for general analysis |
| 488–1983 | Milk — Determination of fat content — Gerber butyrometers |
| 3690–1977/<br>Add.1–1983 | Welding — Determination of hydrogen in deposited weld metal arising from the use of covered electrodes for welding unalloyed and low alloy steels<br>Addendum 1 |
| 6353/2–1983 | Reagents for chemical analysis — Part 2: Specifications — First series |
| 3210–1983 | Anodizing of aluminium and its alloys — Assessment of quality of sealed anodic oxide coatings by measurement of the loss of mass after immersion in phosphoric-chromic acid solution |
| 7097-1983 | Determination of uranium in reactor fuel solutions and in uranium product solutions — Iron (II) sulfate reduction, potassium dichromate oxidation titrimetric method |
| 7692–1983 | Ferrotitanium — Determination of titanium content — Titrimetric method |
| 757/4-1983 | Acetone for industrial use — Methods of test — Part 4: Determination of permanganate time |
| 7408–1983 | Fertilizers — Determination of ammoniacal nitrogen content in the presence of other substances which release ammonia when treated with sodium hydroxide — Titrimetric method |
| 5666/3–1983 | Water quality — Determination of total mercury by flameless atomic absorption spectrometry — Part 3: Method after digestion with bromine |

# IUPAC – SPONSORED CONFERENCES

As suggested on p.26 of CI, 1984, No. 2, further details of some of the Conferences mentioned only briefly in that issue have become available; these are given below, as are details of some of the meetings scheduled for later in the year. Further information can be obtained from the organizers given in the lists on pp. 43–44.

## 5th International Conference on Organic Synthesis, Freiburg i. Br., FRG, 27–30 August 1984

A very brief outline of this Conference was given in CI, 1984, No. 3, p. 27. Further details became available just after that issue went to press.

The *plenary lectures* (60 min) to be given are:

Complexes of transition metals as catalysts in organic synthesis (G. Wilke, FRG).
The synthesis of heterocycles via transition metal chemistry (L. S. Hegedus, USA).
Some recent applications of early transition metal derivatives in organic synthesis — a comparison with main group organometallic compounds (D. Seebach, Switzerland).
Organic synthesis, recombinant DNA technology, and biological evolution (W. Arber, Switzerland).
Selective man-made catalysts (K. B. Sharpless, USA).
Asymmetric synthesis via heterocyclic intermediates (U. Schöllkopf, FRG).
Recent advances on the biosynthesis of penicillin (J. E. Baldwin, UK).
Some synthetic applications of alcohol dehydrogenases and esterases (J. B. Jones, Canada).
Enantioselective synthesis of some carbapenem, aminosugar, and nucleoside antibiotics by chemicoenzymatic approach (M. Ohno, Japan).
Applications of enzymology in organic synthesis (G. M. Whitesides, USA).
Synthetic control leading to the synthesis of carbohydrates (T. Mukaiyama, Japan).
Strategies in oligosaccharide synthesis (H. Paulsen, FRG).

*Invited lectures* (30 min) will be:

The activation and selective functionalization of alkanes by some soluble transition metal systems (H. Felkin, France).
Asymmetric synthesis catalyzed by chiralferrocenylphosphine – transition metal complexes (T. Hayashi, Japan).
Pd-catalyzed reactions of organometallic compounds (I. P. Beletskaya, USSR).
Metal catalyzed addition of small molecules to alkenes and alkynes (W. R. Jackson, Australia).
Magnesium anthracene as a source for soluble atomic magnesium: its use in synthesis and catalysis (B. Bogdanović, FRG).
Stereo- and regio-selective organic transformations by transition metal catalysis (J. E. Bäckvall, Sweden).
Stereoselectivity and stereospecificity: new tools in industrial organic chemistry (J. Martel, France).
New routes to *gem*-dialkylcyclopropane carboxylic acids, application to the synthesis of chrysanthemic acids (A. Krief, Belgium).
Dienylketenes: key compounds in natural products synthesis (G. Quinkert, FRG).
The tertiary amine effect in heterocyclic synthesis: *in situ* generation of 1,5-dipolar intermediates (D. N. Reinhoudt, Netherlands).
New N-ylides and their synthetic utility (H. Greuter, Switzerland).
Stereoselection at 3-carbon units. Recent studies and applications in natural product synthesis (G. Helmchen, FRG).

**The Cathedral, Freiburg im Breisgau**

Chemical and enzymatic synthesis of genes (J. Engels, FRG).
Biohydroxylation of non-activated carbons by the fungus *Beauveria sulfurescens* (R. Furstoss, France).
Carbohydrate-like chiral synthons (C. Fuganti, Italy).
Routes to carbocyclic compounds of pharmaceutical importance from carbohydrates (R. J. Ferrier, New Zealand).
The kinetic anomeric effect in asymmetric synthesis. A new approach to aminophosphonic acids (A. Vasella, Switzerland).
Sugars *versus* non-sugars in organic synthesis (S. Hanessian, Canada).
Carbohydrates in functionally substituted vinyl carbanion chemistry (R. R. Schmidt, FRG).
The stereospecific synthesis of macrobicyclic and macropolycyclic ethers from carbohydrate precursors (J. F. Stoddart, UK).
New approaches to C-glycosides (P. Sinaÿ, France).

In addition to the above lectures, 170 poster presentations are planned.

The Black Forest city of Freiburg im Breisgau was founded in 1120 by the Dukes of Zähringen. From 1368 to 1803 it was under Hapsburg rule, then under Napoleon and finally part of the territory of Baden. It is now a town with a population of some 180 000, including 22 000 students. The whole of the city centre is a pedestrian zone, dominated by the 116-m high tower of the Gothic Cathedral.

## **3rd International Conference on Solid Films and Surfaces,** Sydney, Australia, 27–31 August 1984

The Conference will be held at the University of New South Wales, about 5 km from the city centre of Sydney — the largest city in Australia, population about 3.5 million, and famous for its large harbour.

Topics to be discussed include: Clean surfaces; Interfaces between solids and gases or liquids; Surface characterization; Surface and structure; Electronic properties of thin films; Thin films for solar energy conversion; Surfaces for industrial applications. These will be covered by a series of invited lectures and contributed papers; it is hoped that all papers can be presented orally, even if briefly, and that all speakers will also provide posters.

The *invited lectures* are:
Recent progress in the nondestructive analysis of surfaces, thin films and interfaces by spectroscopic ellipsometry (D. E. Aspnes, USA).
Native defects at the Si/$SiO_2$ interface — Amorphous silicon revisited (D. K. Biegelsen, USA).
IR and LEED studies of high coverage CO adlayers (A. M. Bradshaw, FRG).
Advances in characterizing and controlling metal–semiconductor interfaces (L. J. Brillson, USA).
Ion-assisted gas–surface reactions (J. W. Coburn, USA).
Inverse photoemission (V. Dose, FRG).
Surface defects and Fermi-level pinning in III-V semiconductors and at Si/transition-metal silicide interfaces (J. D. Dow, USA).
Surface structure studies by X-ray photoelectron diffraction (C. S. Fadley, USA).
Atomic structures and electronic properties of Si(111) and Ge(111) cleaved surfaces at low temperatures (V. A. Grazhulis, USSR).
Recent progress in amorphous silicon and its technological applications to opto-electronic devices (Y. Hamakawa, Japan).
The atomic structure of silicon surfaces (F. P. Jona, USA).
Properties of thin films obtained by condensation of metallic atoms through superfluid layers (I. Landau, USSR).
Ionization probability in sputtering (N. D. Lang, USA).
Preparation and characterization of thin films of multi-element semiconductors like $CuInSe_2$ by *Rf*-sputtering and chemical vapour deposition (J. J. Loferski, USA).
LEED intensity profiles and surface phase transitions (E. G. McRae, USA).
Electronic properties and chemical interactions at silicon and III-V compound-semiconductor surfaces (W. Mönch, FRG).
Silicide formation at thin film metal–Si interfaces (R. J. Nemanich, USA).
Quantum size effect in the reflection of slow electrons from thin films (R. L. Park, USA).
Faceting (roughening) transitions on helium-crystal surfaces (A. Parshin, USSR).
Ratio histogramming in scanning Auger microscopy (M. Prutton, UK).
The solid–liquid interface: Preparation, characterization, and reactions at clean surfaces (I. M. Ritchie, Australia).
Chemical bonding in condensed polynuclear transition metal clusters and chemisorbed surfaces (T. N. Rhodin, USA).
Recent progress in experiments on thin film growth in Japan (G. Shimoaka, Japan).
Topics in ultraviolet inverse photoemission (N. V. Smith, USA).
The structure of chemisorbed atoms and molecules on surfaces as determined by SEXAFS and NEXAFS (J. Stöhr, USA).
Investigation of metal surfaces and interfaces by means of conduction electrons (V. Tsoi, USSR).
Atomistic or molecular processes on clean surfaces: Recent advances (II) (R. Ueda, Japan).
Epitaxy at (111) fcc/(110) bcc metal interfaces (J. van der Merwe, South Africa).
Adsorbed xenon atoms as local surface probes (K. Wandelt, FRG).
*In situ* surface studies by electron microscopy (K. Yagi, Japan).

Other lectures, titles not yet known, are expected to be given by J. E. Greene (USA), A. Heller (USA),

N. Sheppard (UK), R.A. Street (USA) and D. P. Woodruff (UK).

Accommodation is available in student colleges on campus or in motels or hotels in the vicinity. The Conference fee is A$170 after 30 June 1984. An interesting additional activity is the 5-km ICSFS-3 run, with certificates issued to participants (even if they don't complete the course?). As the average daytime temperature is expected to be about 18°C, this should be an enjoyable event. There is also the possibility of a visit to the Sydney Opera House (tour, meal and performance).

**University of New South Wales, Sydney. The Clancy lecture hall is in the foreground with the library and engineering buildings behind** *(photo courtesy of the University Photographic Library)*

---

## **10th International Symposium on the Reactivity of Solids,** Dijon, France, 27 August – 1 September 1984

The scientific sessions of the Symposium will be held at the Faculté des Sciences Gabriel, on the campus of the University which is situated in the north-eastern outskirts of Dijon. The programme has been arranged to allow the greatest possible opportunity for oral presentation — as general lectures (55 min), introductory lectures (30 min) and shorter (20 min or less) talks — as well as poster presentations, all split into 15 themes:

1. Corrosion of materials by gaseous reactants.
2. Reactivity of non-crystalline solids.
3. Defects and transport in solids.
4. "Soft" chemistry — Intercalation chemistry.
5. Solid–liquid reactions.
6. Solid–solid reactions.
7. Thermal decomposition of solids.
8. Reactivity in the organic solid state.
9. Mechanical activation of reactions in the solid state.
10. Reactions in ceramics and materials for electronics. (Electrochemistry, electrocatalysis, electronics...).
11. Structural relations in solid state reactions.
12. Role of surface phenomena in the reactivity of solids.
13. Kinetics and kinetical models.
14. Reactivity of solids connected with the catalyst preparation.
15. Various aspects and industrial applications of the reactivity of solids.

The *general lectures* to be given are:

La réactivité des solides hier et aujourd'hui (J. Bénard, France).
The role of surfaces in the reactivity of solids (J.

Haber, Poland).
- Ordering induced by chemical, thermal and mechanical constraints at solids interface (A. Sanfeld, Belgium).
- *In situ* studies of the high temperature oxidation of metals and alloys (R. A. Rapp, USA).
- Interfacial adsorption, segregation and process kinetics in solids (E. D. Hondros, UK).
- Some industrial applications of the reactivity of solids (A. R. C. Westwood, USA).
- Synthèses de phases métastables volumiques et épitaxiales (R. Kern, France).
- The chemistry of ceramic grain boundaries (W. D. Kingery, USA).
- Electron/ion transfer reactions of solids (R. Schöllhorn, FRG).
- Space and materials science: results and prospects (H. Curien, France).

The following 20 *introductory lectures* will also be given during plenary sessions of the Symposium:

- Some perspectives on the mathematical modelling of gas–solid reactions (J. Szekely, USA).
- The reactions of cement compounds with water (H. F. W. Taylor, UK).
- Progress in the understanding of the mechanisms of nucleation and growth of metals from oxides. A study from the NiO-Ni model system (L-C. Dufour, N. Floquet and B. de Rosa, France).
- Oxygen surface diffusion and surface layer thickness in oxides measured by $^{18}O_2$ exchange reaction (W. Komatsu and Y. Ikuma, Japan).
- Corrosion of nickel in $SO_2/O_2/SO_3$ atmospheres (V. Guerra and W. L. Worrell, USA).
- High temperature corrosion of dilute Ni-Mn base alloys in $SO_2 + O_2/SO_3$ at 700°C (B. Haflan, K. P. Lillerud and P. Kofstad, Norway).
- The mechanochemistry of inorganic solids (V. V. Boldyrev, USSR).
- Reactivity problems in production of fine particles and catalysts (B. Delmon, Belgium).
- High pressures in inorganic material-science (G. Demazeau, France).
- Two-stage decomposition characteristics in the thermal decomposition of mixed carbonate systems (B. Fubini, Italy, and F. S. Stone, UK).
- X-ray topographic studies of the role of lattice sub-structure in the progress of reactions in solids (D. B. Sheen and J. N. Sherwood, UK).
- Structural relationships in heterogeneous solid state reactions (H. R. Oswald, Switzerland).
- Defect structure and transport properties of manganese oxides (R. Dieckmann and M. Keller, FRG).
- Effect of dispersion of metallic conducting phase on the electrical transport in nickel oxide (V. B. Tare and J. B. Wagner, USA).
- Gas–solids mechanochemical reactions (P. Yu. Butyagin, USSR).
- Electronic transfer and its effects on reactivity, structures and phase transitions in intercalation chemistry (J. Rouxel, France).
- Organic solid state reactions. Some concepts and applications (H. K. Cammenga, FRG).
- Some structural relationships in the solid state chemistry of hexagonal $WO_3$ (M. Figlarz, B. Gerand, B. Beaudoin, B. Dumont and J. Desseine, France).
- α $Fe_2O_3$ of different origin characterized by the reactivity in the interaction with ZnO (A. Feltz and A. Martin, GDR).
- Les vitraux du Moyen Age et la réactivité des solides. Combien d'années de survie? (M. Perez y Jorba and R. Collongues, France).

The registration fee, after 1 July 1984, is 1300 FF which will entitle participants to use the special bus service to and from Dijon and the campus. Accommodation is available in the students' residence as well as the Dijon hotels, and camping sites, in the vicinity of Lake Kir, can be booked. Daytime temperatures at the end of August should be in the range 13 to 23°C. There may also be light showers.

A brief description of the university and town of Dijon is given on pp. 36–38.

**Pasteur Lecture Hall, University of Dijon**

## **3rd International Conference on Nickel Metabolism and Toxicology,** Paris, France, 4–7 September 1984

The scientific sessions of the Conference will be held in the Hotel PLM St. Jacques in the boulevard St. Jacques. The programme consists of some 55 lectures of 20 min duration (except the 40-min Richard T. Barton Memorial Lecture — Muscle tumourigenesis by nickel compounds, J.P.W. Gilman and S. Yamashiro, Canada) divided into 11 sessions, two on Nickel Carcinogenesis, three on Nickel Toxicology, and one each on Clinical Chemistry of Nickel, Clinical Pathology of Nickel, Medical Aspects of Nickel Exposures, Atmospheric Monitoring of Occupational Exposures to Nickel, Chemical Speciation of Nickel and Health Surveillance of Nickel Workers, Epidemiological Studies of Nickel-exposed Populations.

The Conference fee is US$85 and should have been paid by 15 July 1984. Accommodation is available in a University Residence — Collège Franco-Britannique — as well as in Paris hotels.

PLM HOTEL SAINT JACQUES

**The PLM Hotel St. Jacques, Paris** *(photo courtesy of Hotel Management)*

---

## **Polymer Chemistry Meeting,** Leuven, Belgium, 26–28 September 1984

This Polymer Chemistry Meeting is being held, on the campus of the Katholieke Universiteit Leuven, in honour of Prof. G. Smets on the occasion of his retirement. The scientific programme comprises plenary lectures and contributed papers, the latter in the form of poster presentations.

The *plenary lectures* will be:

Optically active polymers based on macromolecular asymmetry (Helicity) (O. Vogl, USA).

Synthesis, characterization and spectroscopic analysis of cytosyl grafted polyethylenimine (C. G. Overberger, USA).

Recent progress of photo- and radiation-induced ionic polymerization (K. Hayashi, Japan).

Photochemistry of cross-linkable polymers. The role of energy migration (S. Y. Farid, USA).

Molecular design of functional polymers having amino groups (T. Tsuruta, Japan).

Macromonomers, synthesis and applications (P. Rempp, France).

Studies on synthetic polymers carrying fluorescent labels (H. Morawetz, USA).

Laser photochemistry of polymers (H. Masuhara, Japan).

Analysis of the molecular mobility of polymers in the bulk state by fluorescence techniques (L. Monnerie, France).

The role of Lewis bases in the investigation of Ziegler-Natta-polymerization of olefins (P. Pino, Switzerland).

Some new examples of polymer modifications (R. C. Schulz, FRG).

Cooperative interpolyelectrolyte reactions (V. Kabanov, USSR).

Surfactive properties of block and graft copolymers (G. Riess, France).

Free radical ring-opening polymerizations (W. Bailey, USA).

The development of new photoresists for use in the deep ultraviolet (E. Chandross, USA).

Polymer photochemsitry and microlithography (A. Ledwith, UK).

Accommodation is available in hotels in Leuven, 5 km from the campus, or in the University Residencies, about 1 km from the campus. The registration fee, which should have been paid by 1 July 1984, is 4000 BF. The official celebration in honour of Prof. Smets will take place during the symposium banquet.

---

## **2nd International Symposium on the Harmonization of Collaborative Analytical Studies,** Washington, DC, USA, 25–27 October 1984

The scientific sessions of the Symposium will take place in the Lecture Room of the National Academy of Sciences. Its objective is to identify the design essential for the validation of the performance of analytical methods, to establish the requirements for an interlaboratory study in terms of the number and nature of samples, laboratories and replicates which will permit general acceptance of the methods without further testing. The practical problems will be examined in two "workshop" sessions.

The programme will be organized in four sessions:

*Opening Session*
Second Symposium: background and objectives;
AOAC method validation protocol;
Cooperation and collaboration in clinical chemistry 1944 – 1984;
Parameters and definitions.

*Workshop Session I. Design and conduct of collaborative studies*
AOAC validation questionnaire;
The role of cooperative and collaborative studies;
Some collaborative experiences, Trace metals, Drugs, Nutrients, Food, Dairy products, Pesticide formulations.

*Workshop Session II. Interpretation of results*
Analytical nomenclature;
Quality control;
Choice of statistical approach;
Dealing with outliers.

*Conclusions and future actions*
Minimum criteria for validation;
Concluding remarks.

The registration fee of US$45 should be paid by 30 September 1984. Accommodation is available in Washington hotels.

**National Academy of Sciences, Washington**

---

# Golden Jubilee of the Indian National Science Academy

The Indian National Science Academy (INSA) came into being in 1934 — although then known as the National Institute of Sciences of India (NISI) — and had its inaugural meeting on 7 January 1935, its headquarters being in Calcutta. In 1945, NISI was formally recognized by the Indian government as the premier scientific society in India, representing all branches of science, and its headquarters was moved to Delhi. A new headquarters building was started in 1948, the foundation stone being laid by the Prime Minister, Shri Jawaharlal Nehru. The building was completed in 1951 and NISI moved in, to what is still its premises on Bahadur Shah Zafar Marg, New Delhi, although the Institute itself changed its name to the Indian National Science Academy (INSA) in 1970.

The objectives of the Academy are:

To promote the development of natural knowledge in India including its practical application to problems of national welfare;

To effect coordination between scientific academies, societies, institutions and government scientific departments and services;

To act as a body of scientists of eminence for the promotion and safeguarding of the interests of scientists in India and to represent internationally the scientific work of India;

To publish such proceedings, journals, memoirs and other publications as may be found desirable.

The Academy consists of elected Fellows and Foreign Fellows, elected on the basis of their eminence in, and contributions to, science and technology. At the moment there are 516 Fellows (maximum 700) and 88 Foreign Fellows (maximum 100). These Fellows belong to one of the discipline-oriented Section Committees, the one with the second higher number of members being that of Chemical Sciences (77 members; Physics has 80).

One of the activities of the Academy is to organize international seminars and conferences sponsored by ICSU and its affiliated Unions. Recent conferences of this type were: International Congress on Genetics; 7th International Biotechnology Symposium; International Symposium on New Vistas in Organometallic Chemistry. Local conferences, workshops and

INDIAN NATIONAL SCIENCE ACADEMY
स्वर्ण जयन्ती
GOLD JUBIL
A.K. SHARMA
M G K MENON

The Prime Minister of India, Mrs. Indira Gandhi, presenting a medal and commemorative plaque to the senior Foundation Fellow, Prof. K. G. Ramanathan

Mrs. Gandhi, accompanied by the INSA President, Prof. A. K. Sharma, and the Immediate Past President, Prof. M. G. K. Menon, approaches the dais and passes the Office bearers of INSA symposia on subjects of topical interest are also organized by INSA.

The inaugural function of the Golden Jubilee was held on 16 January 1984 when the Prime Minister of India, Mrs. Indira Gandhi, gave the inaugural address at Vigyan Bhawan, New Delhi, in the presence of a packed gathering including a galaxy of scientists from India and abroad. Among the distinguished guests from abroad were the Presidents and Vice-Presidents of scientific academies from China, France, Hungary, Japan, Malaysia, Nepal, Pakistan, Poland, Singapore, Sri Lanka, UK, USA and USSR.

## IUPAC PEOPLE

**Congratulations to:**

**Prof. K. H. Büchel** (Chairman, COCI) on the receipt of the 1983 Burdick & Jackson International Award for research in pesticide chemistry. The Award will be presented by the Division of Pesticide Chemistry, American Chemical Society, in Philadelphia, August 1984.

Prof. K. H. Büchel, Chairman of COCI

**We regret to record the death of:**

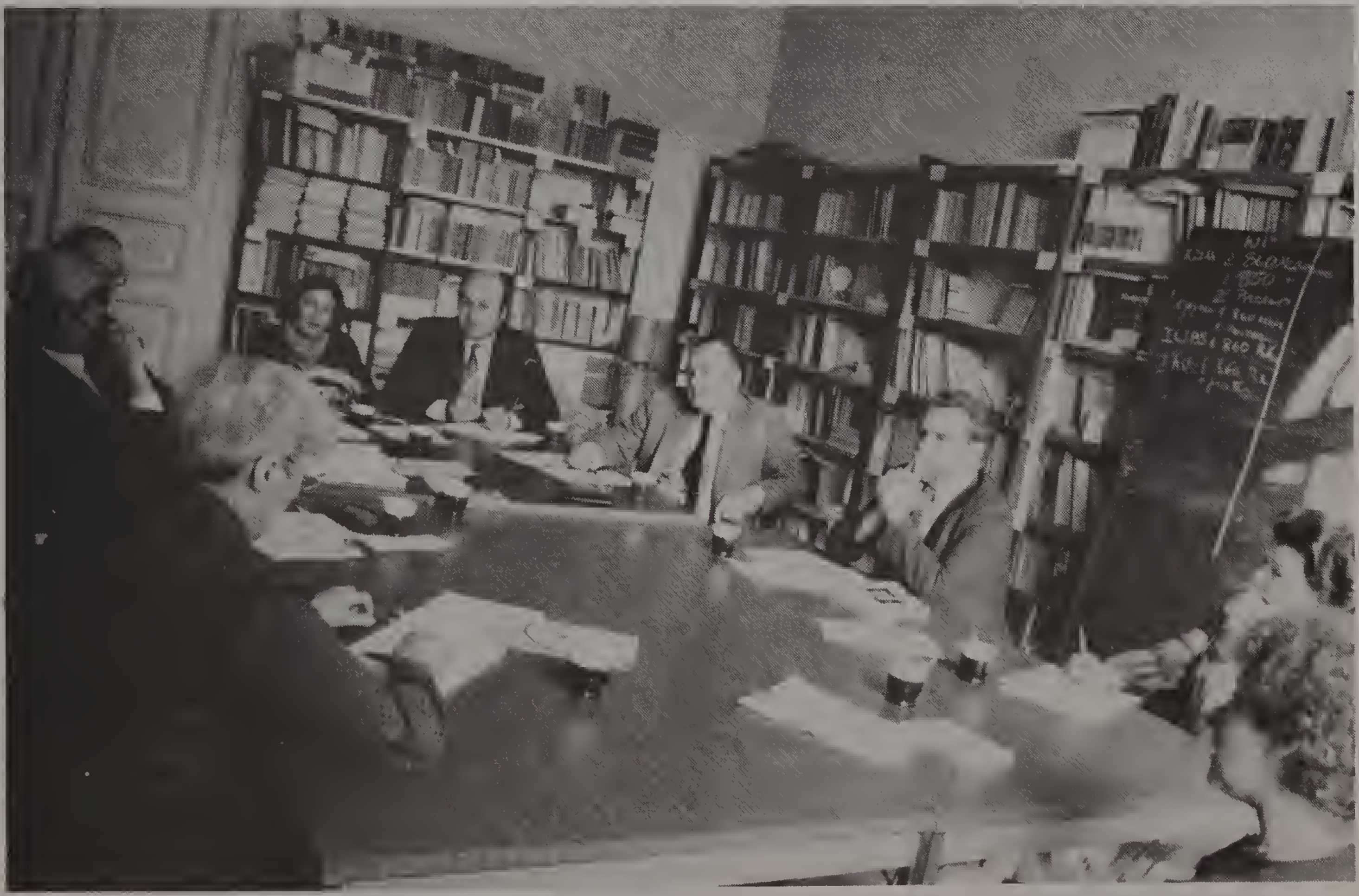
**Dr. M. B. A. Crespi,** Argentina (14 April 1984) — Commission on Analytical Radiochemistry and Nuclear Materials (1965–1983).

The late Dr. M. B. A. Crespi

# Meeting of Executive Secretaries

The first informal meeting of the Executive Secretaries of ICSU bodies took place earlier this year at the ICSU Secretariat, Boulevard de Montmorency, Paris. Items discussed were: word processing facilities and international communication linkages, publications and newsletters, UNESCO contracts, international status, and finances. As a result of the informative exchange of views, it was considered that the meeting was well worth while and that similar meetings should be held every so often in the future.

**Right: The Hôtel de Noailles, 51 Bd. de Montmorency, from the garden**



**The Executive Secretaries meet at the ICSU Secretariat, Paris. Reading clockwise round the table, from bottom left, Mme. B. Manning, IAU; Dr. M. Williams, IUPAC; Dr. J. N. King, IUCr; Mme. J. Marton-Lefevre, Assistant Executive Secretary, ICSU; Dr. T. Younès, IUBS; Mr. Z. Niemirowicz, COSPAR; Mr. F. W. G. Baker, ICSU; Mme. Y. Stevanovitch, URSI; Miss M. Orfus, ICSU AB.**

# DIJON — City and University*

## The City

Dijon owes its origin to the fact that, since prehistoric times, people lived on the heights near its present location and, later, to the existence of a commercial relay-station at the crossing of two main routes — the 'tin route' from Great Britain and the north–south route (the Agrippa Way of the Romans) which, via the valleys of the Rhône and Saône, linked the Mediterranean and the Germanic countries. The town was known as Divio in the 2nd century AD when it was quite prosperous but was ruined in the first barbarian invasion in the 3rd century. It was rebuilt within a walled fortification, the Castrum, which formed the heart of the present city. To the west a suburb developed round the Abbey of St. Bénigne, founded in the 6th century over the tomb of the legendary martyr who had evangelized Burgundy, which spread up to the city walls. A fire devastated both the old city and suburbs in 1137 after which a new and larger wall was built to enclose both parts — this wall, with some modifications, remained up to the 19th century.

Dijon was the capital of the duchy of Burgundy which reached its peak of importance under the second ducal dynasty, that of Valois (1364-1477). These dukes — Philippe le Hardi (Philip the Bold), Jean sans Peur (John the Fearless), Philippe le Bon (Philip the Good) and Charles le Téméraire (Charles the Reckless) — were masters of Burgundy, of Franche-Comté, of the regions of Niverne and Artois, of Flanders, and of all the lands which now make up Belgium, Luxembourg and Holland. They made Dijon an artistic centre with many fine buildings, parts of which still survive.

This artistic tradition continued through the centuries after Burgundy returned to the royal domain and Dijon became a provincial capital. Of particular architectural interest are the cathedral of St. Bénigne (rebuilt 14th century), the churches of St. Philibert, of Notre Dame, of St. Michel (examples of 16th–18th century building), and the Hôtel de Ville, containing the 14th–15th century ducal palace. In the 18th century Dijon became an intellectual centre with the foundation of the University, the Academy, the School of Fine Arts and the Museum. The prosperity of the city was brought to an end by the Revolution, which suppressed all provincial institutions.

Later, with the building of the Burgundy canal, joining the Saône and the Seine, and a network of roads, Dijon began to recover and, with the coming of the railways in the 19th century, a rapid return to its former importance and vitality started. There has been a rise in population from 22,000 inhabitants in 1850 to the present-day 120,000.

## The University

It was already the Renaissance in Dijon in the 16th century: François I, between two campaigns, decided to create five universities — at Paris, Orléans, Augers, Poitiers and Dijon — saying of Dijon "A countryside as fertile as any, very conducive to study and spiritual exercise". However, the University of Dijon remained just a theory. Founded only in 1722, the University Burgundiae with a single Faculty (of Law) had at the end of the 18th century only five professors and 200 students.

Closed down at the time of the Revolution, the University was reconstituted by Napoleon I who set up three Faculties (Law, Science and Letters) and a School of Medicine. During the whole of the 19th century and the first years of the 20th there were very few professors (four in each Faculty) and the number of students increased very slowly (less than one thousand at the beginning of the last war). The very existence of the University was questioned and it was very nearly closed down again in 1946.

From 1950 onwards, under the effect of a worldwide movement, the University saw its student population begin to flourish. The Rector at that time, Prof. Marcel Bouchard, foresaw great progress and had the courage to build, outside the town on the Montmuzard hill, the new Faculty of Sciences, inaugurated in 1957. This was the beginning of a large campus on to which all the University Establishments moved one after the other, instead of being scattered

---

*The Editor is grateful to Prof. P. Barret for the background information on which this article was based and for the photographs, specially taken by Mr. Delarche.

Church of Notre Dame, Dijon

The Bar Tower in the Palace of the Dukes of Burgundy

UNIVERSITE DE DIJON
CAMPUS UNIVERSITAIRE

Conference Building, Faculty of Sciences over the centre of the city. The University currently has about 16,000 students and 840 teaching research workers, grouped into 16 teaching and research units — many have earned, from their international value, recognition by the large national organizations (CNRS, INSERM, etc.).

The University of Dijon, the only one in the Burgundy Region, is broadly multidisciplinary: philosophy, medicine, mathematics and other exact sciences, law and sociology — with numerous technological aspects — all the disciplines are represented and constitute an obviously well-balanced whole.

Echauguette (a watch tower), Place des Ducs, Dijon

ANTIQUITES
Liliane

Rue Verrerie, Dijon

# THE STATE UNIVERSITY OF GHENT

The Congress of Vienna, which decided to unite the former Seventeen Provinces of the Low Countries and the Principality of Liège under the rule of the Prince of Orange, opened on 18 September 1814. As early as 7 November of the same year, the Municipal Council of Ghent sent the following motion to William, Prince of Orange-Nassau:

> Bearing in mind that subsequent to the Pacification of Ghent, in 1576, a university had been established at Ghent under the august House of Orange; that this university had been destroyed by the agency of an impious war, and that, consequently, the City of Ghent only applies anew for something that had been ardently wished for by the ancestors of the magnanimous Prince, who has been called upon by the great allied Powers to accept the crown for the good of our province.
>
> And considering that the very decree which in 1578 established a university at Ghent might be considered to have been merely suspended and that the present petition from the City of Ghent has as its aim not so much the establishment as the re-establishment of that which had been granted by the illustrious House of Orange-Nassau.

In fact, a Calvinist University had been in existence at Ghent from 1578 to 1584, under the republican régime of de Hembyze. Similarly, under the Austrian rule, there had been, from 1745 onwards, a Collegium Medicum at Ghent which purported to train doctors. The level of learning and lecturing, however, had not been particularly high.

In referring to the Calvinist University of 1578 the Town Council invoked, not without good reason, rights that appeared ancient and undeniable to the Protestant monarch who, as early as September 1815, made preparations for endowing the Belgian provinces with a real system of higher education. One cannot too much emphasize the role which the city of Ghent played in the events which eventually led to the foundation and the erection of the present University. Being a city with a past, keenly aware of its historical significance, as well as an industrial city imbued with a sense of its cultural vocation, the town did not so much accept a university as demand one; Ghent insisted upon having its university and then bestowed upon it liberal endowments. On October 9, 1817, in a memorable ceremony which took place in the Throne-Room of the Town Hall in the presence of the Crown Prince, the University of Ghent made a truly royal debut; four Faculties, sixteen professors (nine of them foreigners), and one hundred and ninety students, with Latin as the language of instruction.

In 1819 the City of Ghent laid the foundation stone of a vast building estate designed by Roelandt, the neo-classical architect. Completed in 1826, this encompassed, between the Voldersstraat and the Universiteitsstraat, the buildings which then housed the four Faculties and the administrative staff and of which several are not without artistic pretensions even today. However, the famous August Kekulé, even as late as 1859, said of the University: "Die Universität ist äusserlich ein Palast, innerlich aber Nichts als Mangel an Raum".

The Dutch régime rendered inestimable services to Belgian higher education. First by the introduction of inter-university examinations, then by exempting university students from military service, it helped to raise the University to European status. The setting up in 1825 of an 'Industrial School' attached to the Faculty of Science foreshadowed and promoted the growth of the 'Technical Schools' which were to bring such glory to the University.

The Belgian revolution of 1830 did not appreciate overmuch William I's exertions on behalf of the Belgian universities: the Faculties of Philosophy and Letters and of Science were abolished, the foreign professors discharged. Revolutions — one can observe it all the time — are concerned with many things: with independence, with government (temporary or otherwise), with the army, with pride in ancestry, even with the National Anthem; but they never excel in showing gratitude.

When it had acquired greater stability, the government of the new Kingdom of Belgium reorganized higher education by the law of 25 September 1835. In many respects the effort was praiseworthy: there was to be not a single, central university, but, once again, two State Universities — one at Liège and the other at Ghent — both of them oriented towards the cultures of the respective regions in which they were situated. As far as the University of Ghent was concerned, there were thirty-five professors, including nine foreigners; French replaced Latin as the language of instruction; and 'Special Schools' were created, which opened in 1838. These 'Technical Schools', the outcome and embodiment of their age, were not intended to serve pure and disinterested science; they were, on the contrary, destined to produce highly qualified professional men and to explore the practical possibilities which science holds.

The student population, whose number had risen to 414 in 1830, did not exceed 327 in 1860, in spite of the fact that the 'Special Schools' had been in existence for a quarter of a century. Another 5 years were to elapse before the numerical level of 1830 was surpassed. And yet, from 1841 to 1876, the students of Ghent, although belonging to a university whose student population was the smallest in the country, obtained by far the best results at the inter-university examinations. This was because such outstanding teachers held the Chairs there. Among the professors of the Faculty of Letters were such prominent names as Roulez, Gantrelle and Wagener; the Faculty of Law boasted the famous Haus and François Laurent; in the Faculty of Science, there were the physicist Plateau (the blind genius), the chemist August Kekulé von Stradonitz (famous for his 'Benzol theory'), the chemist Adolf von Bayer (Nobel prizewinner for 1905), and Paul Mansion, the mathematician; in the Faculty of Medicine, there was the psychiatrist Guislain, who was the first man in the world to teach a university course in psychiatry.

Since the standing of a university is not measured by the number of students entering it, but by the number and, above all, by the quality of its professors and by the knowledge and the professional ability of the young people whom it instructs, it will be profitable to linger over several outstanding individuals and some famous names. During the period 1890–1930, the Faculty of Philosophy and Letters was one of the most brilliant in Western Europe: there were the historians Fredericq and Pirenne, the father of the School of History of Ghent; in the field of philology and classical archaeology, there were Thomas, Bidez, Franz Cumont, Graindor, the Indo-European expert de la Vallée Poussin, the art critic Hulin de Loo and the Germanic philologists Vercouillie and Logeman. Among the professors of the Faculty of Science were the mathematician Mansion, the thermodynamics expert Boulvin, the zoologist and botanist MacLeod, the chemist Swarts and the geologist Cornet. The bacteriologist Van Ermengem, who in 1895 discovered the "botulism" bacillus, the pharmacologist J. F. Heymans and the ophthalmologist Daniel van Duyse illustrate the quality of the professors of the Faculty of Medicine. It is extremely interesting to note that, in 1929–1930, for example, the 'Special Schools' accounted for more than 61% of the student body and that for all four faculties and for the special schools the number of foreign students reached nearly 37%.

Meanwhile, the needs of an ever-growing university for space, added to the new requirements of academic methods and the influx of students at the end of the 19th century, forced the authorities to erect the necessary buildings, but the City itself was no longer able to carry the whole financial burden. As a consequence, from 1880 to 1930, the State was to share responsibility for the university buildings equally with the City.

Owing to the historical factors, which would not have exerted so strong an influence if certain of the ruling classes in Flanders and in the Kingdom of Belgium during its first century of independence had not been so favourable to them, the Flemish-speaking regions, impoverished and but little industrialized, had not reached in the 19th century the cultural level to which their glorious past and the vitality of their population entitled them. This aim was made even more difficult for them to reach by the fact that the Flemish language was considered unworthy of being used in polite society as well as unfit to be the vehicle of serious, let alone higher education. Even as late as 1920, in the only official university situated in the Flemish-speaking part of the country, and which was destined to produce Flemish graduates who would carry on their professions as lawyers, doctors, teachers, and engineers in the Flemish-speaking provinces, the language of administration and instruction was still French. It is as if the German-speaking part of Switzerland were to have only French-speaking universities.

Towards the middle of last century, a romantic and popular movement, which spread all over Europe, stirred the very conscience of the people in Flanders. (Jan Frans Willems, of Ghent, is the outstanding example here.) After various attempts, even at the parliamentary level, which were unsuccessful only because they were rather isolated, the movement in favour of the introduction into the University of Ghent of the Flemish linguistic régime eventually constituted itself into a unified front in 1897. The man who gave the first impetus to the movement was Julius MacLeod, the famous Professor of Botany of the University, but it was finally left for the economist Lodewijk De Raet to direct, from 1906 onwards, the course of the struggle. De Raet, a man of keen intellect and noble character, was animated by a passion and devotion which literally killed him at the age of 44. Not content with introducing the Flemish language piecemeal and gradually, he wanted this transformation to happen quickly and forthwith, and desired above all that the 'Special Schools' should turn Flemish without further delay. In this he was supported by public opinion and by certain Members of Parliament — then came the 1914–1918 war.

After 1918, Albert I, the soldier King of the Yser, took up the idea of a Flemish University at Ghent. The gesture was noble, the opposition fierce. Even parliamentary opposition is not strong enough to impede the realization of a good and just idea: in 1930 the law making the University of Ghent a fully-fledged Flemish university was passed with a large majority in both Assemblies. The Kingdom of Belgium was 100 years old. The granting of an appropriate linguistic régime to the University of Ghent was a handsome present — though a little overdue, considering that it was a basic right. The first Rector of the Flemish University was August Vermeylen, a famous scholar revered by the whole of Flanders. His motto was: "Be a good Fleming in order to become a good European". To appreciate these words, which testify to the breadth of Vermeylen's outlook, we should bear in mind that they were written in 1930. In Belgium, the fact that the Flemish linguistic régime was introduced into the University of Ghent had far-reaching consequences: higher education in the Flemish-speaking parts of the country spread and completely re-aligned itself. In Flanders the linguistic barrier, which for a century and a half had separated the ruling classes from the ordinary people, was removed and the children of the working class and the middle classes were at last able to go to the University.

From 1930 to 1940, the Flemish University embarked upon a new career. Outwardly, the new growth expressed itself in an almost frenetic building policy, to be carried out henceforth by the Ministry of Education. This time, however, it made a daring and lofty addition to the number of towers already existing in the City of Ghent. On Blandijnberg the famous professor and architect Henry Van de Velde, assisted by Cloquet junior and by the great Magnel, build a Library Tower that had a surface area of 380 m$^2$, was 64 m high, had 26 floors and had a capacity of 2 000 000 volumes. The first of its kind in Europe, the Library Tower was a surprisingly beautiful construction. During recent years remarkable efforts have been made towards speeding up the building program of this growing university. Since 1957 the University had been expanded and modernized without interruption. At each stage of its development it has altered the face of Ghent, while at the same time adapting itself to the growth and development of the City.

**St. Bavo's Cathedral, Ghent** *(photo courtesy of Dienst Toerisme Stad Gent)*

The present day University has a student population of about 12 000, divided amongst ten Faculties —

Philosophy and Letters
Law
Science
Medicine
Applied Sciences (Engineering)
Economic Sciences
Veterinary Medicine
Psychological and Educational Sciences
Agricultural Sciences
Pharmaceutical Sciences.

The editor is grateful to Dr. W. Baeyens and the University Public Relations Department for providing the information for this article. A photograph of the Faculty of Pharmaceutical Sciences appeared in CI, 1984, No. 3, p. 30, for which we omitted to acknowledge the Laboratoria voor Farmaceutische Chemie en Ontleding van Geneesmiddeln.

---

## International Association for Great Lakes Research

The Association is a multidisciplinary organization whose objectives are to promote, publish and present results of research on the North American Great Lakes and other large lakes of the world. Its publications may be of interest to people in different environmental groups particularly now that there is much interest in the problems of contaminants in the Great Lakes. Further information about the Association and its journal may be obtained from Mr. W. L. Richardson, USEPA, Large Lakes Research Station, 9311 Groh Road, Grosse Ile, MI 48138, USA.

# 30th International Congress of Pure and Applied Chemistry

The 30th IUPAC Congress will be held in Manchester, UK, 9–13 September 1985. The Congress Plenary Address will be given by Prof. Sir George Porter during the Opening Ceremony, after which the Congress scientific programme will develop in eight Sections.

1. ANALYTICAL — Current progress in analytical analytical chemistry
   a. New instrumental methods of analysis
   b. Advances in automatic methods, to include microcomputers
   c. Environmental analysis
   d. Biotechnology — Analytical applications

2. EDUCATION
   a. Chemical education research
   b. Laboratory work: aims, assumptions and realizations
   c. Continuing education in chemistry
   d. Changing requirements in manpower skills (jointly with 3e)

3. INDUSTRIAL — Chemical industry: Year 2001
   a. Future basic feedstocks
   b. Processes for the future — Invention and design
   c. Environmental challenge
      (i) The challenge of public opinion
      (ii) The global challenge
   d. International and regional factors
   e. Changing requirements in manpower skills (jointly with 2d)

4. INORGANIC
   a. Electrochemistry and electron-transfer in inorganic and bio-inorganic chemistry
      (i) Electrochemical synthesis of inorganic and organometallic compounds
      (ii) Electron-transfer reactions in biological systems
      (iii) Electron-transfer reactions in coordination chemistry and catalysis
      (iv) Electron-transfer in extended lattices
   b. Chemistry of *p*-block elements
      (i) Organometallic and organometalloid compounds of *p*-block elements
      (ii) Cluster compounds involving *p*-block elements
      (iii) Coordination chemistry of *p*-block elements
      (iv) Chemistry of the *p*-block elements and their compounds with transition metals
   c. Applications of new techniques in inorganic chemistry
      (i) Infrared spectroscopy: a new light on an old technique
      (ii) Use of lasers in inorganic chemistry
      (iii) FT-nmr in high pressure and stopped-flow studies
   d. Metals in chemotherapy and radiation therapy
      (i) Use of compounds of radioactive isotopes in radiation therapy and diagnosis
      (ii) Use of platinum and other metal compounds in chemotherapy

5. ORGANIC — Organic chemistry as a life science

6. ORGANIC — Dyestuffs: Past, present and future

7. PHYSICAL
   a. Reaction dynamics in the gas phase and in solution
      (i) Dynamics in solution and supercooled jets
      (ii) Dynamics of photodissociation and photoionization
      (iii) Dynamics of chemical reactions and energy transfer
      (iv) Dynamics of gas surface scattering (jointly with 7c (i))
   b. Micellar systems
   c. Surface science of solids
      (i) Dynamics of gas surface scattering (jointly with 7a (iv))
      (ii) Reaction kinetics and catalysis at surfaces
      (iii) Theory of dynamic processes at surfaces
      (iv) Phase transitions at surfaces

8. PHYSICAL/ANALYTICAL — New electrochemical sensors
   a. Fundamentals
   b. Gas sensors
   c. Ion selective electrodes
   d. CHEMFETS and integrated devices
   e. Biosensors

It is expected that the Congress fee will be £90 and that accommodation will be available in student halls of residence or hotels at special rates. Further details of all the arrangements are to be found in the Second Circular, now available from Dr. J. F. Gibson, 30th IUPAC Congress, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.

# IUPAC CONFERENCES

## 1984

### CHEMICAL THERMODYNAMICS

August 13–17. Conference on Chemical Thermodynamics. Hamilton, Canada.
(Dr. P. A. G. O'Hare, Argonne National Laboratory, Chemical Technology Division, 9700 South Cass Avenue, Argonne, IL 60439, USA.)

### NON-AQUEOUS SOLUTIONS

August 13–17. 9th International Conference on Non-aqueous Solutions. Pittsburgh, Pennsylvania, USA.
(Prof. J. F. Coetzee, Department of Chemistry, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA.)

### PHYSICAL ORGANIC CHEMISTRY

August 20–24. 7th IUPAC Conference on Physical Organic Chemistry. Aukland, New Zealand.
(Prof. B. R. Davis, Chemistry Department, University of Aukland, Private Bag, Aukland, New Zealand.)

### INSULATING CRYSTALS

August 20–24. International Conference on Defects in Insulating Crystals, Salt Lake City, Utah, USA.
(Prof. B. Henderson, Department of Pure and Applied Physics, Trinity College, University of Dublin, Dublin 2, Ireland.)

### SOLUBILITY PHENOMENA

August 21–23. 1st International Symposium on Solubility Phenomena. London, Ontario, Canada.
(Dr. M. Salomon, P.O. Box 254, Fair Haven, NJ 07703, USA.)

### COLLOIDS AND MACROMOLECULES

August 22–24. International Symposium on Physical Chemistry of Colloids and Macromolecules. Uppsala, Sweden.
(Prof. B. Ranby, Department of Polymer Technology, Royal Institute of Technology, S-100 44 Stockholm, Sweden.)

### ORGANIC SYNTHESIS

August 27–30. 5th International Conference on Organic Synthesis. Freiburg i. Br., FRG.
(Prof. H. Prinzbach, Chemisches Laboratorium, Universität Freiburg, Albertstrasse 21, D-7800 Freiburg i. Br., FRG.)

### CAROTENOIDS

August 27–31. 7th International Symposium on Carotenoids. Munich, FRG.
(Prof. W. Rau, Botanisches Institut der Universität München, Menzinger Strasse 67, D-8000 München 19, Federal Republic of Germany.)

### SOLID FILMS AND SURFACES

August 27–31. 3rd International Conference on Solid Films and Surfaces. Sydney, Australia.
(Prof. D. Haneman, School of Physics, University of New South Wales, P.O. Box 1, Kensington, N.S.W. 2033, Australia.)

### MEDICINAL CHEMISTRY

August 27–31. 8th International Symposium on Medicinal Chemistry. Uppsala, Sweden.
(8th International Symposium on Medicinal Chemistry, The Swedish Academy of Pharmaceutical Sciences, P.O. Box 1136, S-111 81 Stockholm, Sweden.)

### RAMAN SPECTROSCOPY

August 27–September 1. 9th International Conference on Raman Spectroscopy. Tokyo, Japan.
(Prof. Mitsuo Tasumi, Department of Chemistry, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

### REACTIVITY OF SOLIDS

August 27–September 1. 10th International Symposium on the Reactivity of Solids. Dijon, France.
(10e ISRS, Secrétariat Exécutif, Laboratoire de Réactivité des Solides, Faculté des Sciences Mirande, B.P. 138, F-21004 Dijon Cédex, France.)

### LUMINESCENCE SPECTROMETRY

September 3–6. International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr. W. R. G. Baeyens, Fakulteit van de Farmaceutische Wetenschappen, Laboratoria voor Farmaceutische Chemie en Ontleding van Geneesmiddeln, Harelbekestraat 72, B-9000 Ghent, Belgium.)

### NICKEL METABOLISM AND TOXICOLOGY

September 4–7. 3rd International Conference on Nickel Metabolism and Toxicology. Paris, France.
(M. C. Bozec, Société Metallurgique Le Nickel-SLN, Tour Maine Montparnasse, 33 avenue du Maine, F-75751 Paris Cédex 15, France.)

### ORGANOSILICON CHEMISTRY

September 9–14. 7th International Symposium on Organosilicon Chemistry. Kyoto, Japan.
(Prof. M. Kumada, Chairman of VIIth ISOS, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

### POLYMER CHEMISTRY

September 26–28. Polymer Chemistry Meeting. Leuven, Belgium.
(Dr. H. Vankerckhoven, Laboratorium voor Macromoleculaire en Organische Scheikunde, K.U. Leuven, Celestijnenlaan 200F, B-3030 Leuven (Heverlee), Belgium.)

### AUTOMATION

October 15–18. 2nd International Congress on Automation in the Clinical Laboratory. Barcelona, Spain.
(The Secretary of the Second Congress, Dr. R. Galimay, Apartado de Correos 543, Barcelona, Spain.)

### COLLABORATIVE CHEMICAL ANALYSIS

October 25–27. 2nd International Symposium on the Harmonization of Collaborative Analytical Studies. Washington, DC, USA.
(Dr. H. Egan, Laboratory of the Government Chemist, Cornwall House, Stamford Street, London SE1 9NQ, UK.)

## 1985

### POLYMER ANALYSIS

February 11–14. POLYMER 85: Characterization and Analysis of Polymers. Melbourne, Australia.
(Dr. J. H. O'Donnell, Polymer & Radiation Group, Department of Chemistry, University of Queensland, Brisbane 4067, Australia.)

### ANALYTICAL CHEMISTRY

April 15–19. 2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Pretoria, RSA.
(Dr. A. Strasheim, Department of Chemistry, University of Pretoria, Pretoria 0002, Republic of South Africa).

### NONCRYSTALLINE ORDER IN POLYMERS

May 27–30. International Symposium on Noncrystalline Order in Polymers. Naples, Italy.
(Prof. P. Corradini, Dipartimento di Napoli, Universita di Napoli, Via Mezzocannone 4, I-80134 Napoli, Italy.)

### BIOORGANIC CHEMISTRY

June. 1st International Symposium on Bioorganic Chemistry. New York City, NY, USA.
(Prof. R. Breslow, Department of Chemistry, Columbia University, New York, NY 10027, USA.)

### SURFACE AND COLLOID SCIENCE

June 24–28. 5th International Conference on Surface and Colloid Science. Potsdam, NY, USA.
(Prof. E. Matijević, Institute of Colloid and Surface Science, Clarkson University, Potsdam, NY 13676, USA.)

### PLASMA CHEMISTRY

July 1–5. 7th International Symposium on Plasma Chemistry. Eindhoven, Netherlands.
(Prof. D. C. Schram, Department of Physics, Technische Hogeschool Eindhoven, P.O. Box 513, NL–5600 MB Eindhoven, Netherlands.)

### POLYMER COMPOSITES

July 8–11. 28th Microsymposium on Macromolecules: Polymer Composites. Prague, Czechoslovakia.
(Dr. P. Cefelin, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 1888 Petriny, Prague 6, Czechoslovakia.)

### ORGANOMETALLIC CHEMISTRY

July 12–15. 3rd International Symposium on Organometallic Chemistry directed toward Organic Synthesis. Kyoto, Japan.
(Prof. H. Nozaki, Department of Industrial Chemistry, Kyoto University (Kogaku-Bu), Yoshida, Kyoto, 606 Japan.)

### AROMATIC COMPOUNDS

July 15–19. 5th International Symposium on Novel Aromatic Compounds. St. Andrews, UK.
(Dr. P. J. Garratt, Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, UK.)

### INTERACTIONS IN SOLUTION

July 15–19. 7th International Symposium on Solute-Solute-Solvent Interactions. Reading, UK.
(Dr. A. D. Pethybridge, Department of Chemistry, The University of Reading, Whiteknights, Reading, Berkshire, RG6 2AD, UK.)

### MYCOTOXINS AND PHYCOTOXINS

July 22–25. 6th International Symposium on Mycotoxins and Phycotoxins. Pretoria, RSA.
(Dr. P. S. Steyn, National Chemical Research Laboratory, Council for Scientific and Industrial Research, POB 395, Pretoria 0001, Republic of South Africa.)

### CATIONIC POLYMERIZATION

August 12–15. 7th International Symposium on Cationic Polymerization and Related Processes. Jena, GDR.
(Prof. G. Heublein, Sektion Chemie, Friedrich-Schiller-Universität, DDR–6900 Jena, German Democratic Republic.)

### MACROMOLECULES

August 18–23. 30th International Symposium on Macromolecules. The Hague, Netherlands.
(Dr. J. A. M. Smit, Gorlaeus Laboratories, University of Leiden, Department of Chemistry, P.O. Box 9502, NL-2300 RA Leiden, Netherlands.)

### THERMAL ANALYSIS

August 19–23. 8th International Conference on Thermal Analysis. Bratislava, Czechoslovakia.
(Dr. P. K. Gallagher, Rm 6D-311 Bell Laboratories, Murray Hill, New Jersey 07974, USA.)

### CHEMICAL EDUCATION

August 23–28. 8th International Conference on Chemical Education: Widening the Scope of Chemistry. Tokyo, Japan.
(Prof. J. T. Shimozawa, Secretary General of 8–ICCE, c/o The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

### MASS SPECTROMETRY

September 8–13. 10th International Symposium on Mass Spectrometry. Swansea, UK.
(Prof. J. H. Beynon, Royal Society Research Unit, University College of Swansea, Swansea SA2 8PP, UK.)

### IUPAC CONGRESS

September 9–13. 30th International Congress of Pure and Applied Chemistry. Manchester, UK.
(The Royal Society of Chemistry, Burlington House, London, W1V 0BN, UK.)

### CHEMICAL RESOURCES OF THE OCEAN

September 22–28. Chemical Resources of the Global Oceans — CHEMRAWN IV. Massachusetts, USA.
(J. R. Moore, Director, Marine Science Institute, University of Texas, Austin, TX 78712, USA.)

## 1986

### PESTICIDE CHEMISTRY

August 10–17. 6th International Pesticide Chemistry Congress. Ottawa, Canada.
(Dr. H. V. Morley, London Research Station, Agriculture Canada, University Sub-Post Office, London, Ontario, Canada.)

### NATURAL PRODUCTS

August 17–23. 15th International Symposium on the Chemistry of Natural Products. The Hague, Netherlands.
(Prof. U. K. Pandit, Laboratorium voor Organische Scheikunde, Universiteit van Amsterdam, Nieuwe Achtergracht 129, NL-1018 WS Amsterdam, Netherlands.)

### PHYSICAL ORGANIC CHEMISTRY

August 24–29. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan.
(Prof. M. Oki, Department of Chemistry, Faculty of Science, University of Tokyo, Tokyo 113, Japan.)

# REVISIONS TO IUPAC HANDBOOK

## CI, 1984, Supplement

Additions and amendments to the alphabetical list of members between 31 March and 5 June 1984 are given below.
Additions, new entries, are marked with an asterisk.
Amendments are shown by # at the beginning of the line in which the revision occurs.

*BEEK, Prof. W. J., Unilever Research Laboratorium, PO Box 114,
3130 AC Vlaardingen, Netherlands
(TEL: +31 (10) 353000. TELEX: 23261 URL VL NL) (10)
Associate Member CHEMRAWN Committee (1984-1988)

*DRENTH, Prof. W., Ovidiuslaan 4, 3584 AW Utrecht, Netherlands (22)
National Representative III.2 (1984-1985)

*DRESCHER, Dr. N., BASF Aktiengesellschaft, Landwirtschaftliche Versuchsstation,
Postfach 220, D-6703 Limburgerhof, Federal Republic of Germany
(TEL: +49 (6236) 68235. TELEX: 464600 BASF D) (34)
National Representative VI.5 (1984-1985)

*FIECHTER, Prof. A., Eidgenössische Technische Hochschule, Institut für Biotechnologie,
ETH-Hönggerberg/HPT, CH-8093 Zürich, Switzerland
(TEL: +41 (1) 377 20 88) (33)
National Representative VI.2 (1984-1985)

*GRUNANGER, Prof. P., Istituto di Chimica Organica, Facoltà di Scienze,
Università di Pavia, Via Taramelli 10, I-27100 Pavia, Italy (21)
National Representative III.1 (1984-1985)

*HAYES, Dr. A., Imperial Chemical Industries PLC, Imperial Chemical House,
Millbank, London SW1, UK (10)
Associate Member CHEMRAWN Committee (1984-1988)

*KLEIN, Prof. J., Institut für Technische Chemie, Technische Universität Braunschweig,
Hans-Sommer-Strasse 10, D-3300 Braunschweig, Federal Republic of Germany (10)
Associate Member CHEMRAWN Committee (1984-1988)

*MOO-YOUNG, Dr. M., Department of Chemical Engineering, University of Waterloo,
Waterloo, Ontario N2L 3G1, Canada
(TEL: +1 (519) 885 1211. TELEX: 069-55259 CA) (32)
National Representative VI.2 (1984-1985)

*SUWANDI, Prof. M. S., No. 58, Jalan SS 21/22, Damansara Utama,
Petaling Jaya, Selangor, Malaysia
(TEL: +60 (3) 341000. TELEX: 31469 MA) (18)
National Representative I.6 (1984-1985)

Amendments:

BECK, Prof. M. T., Fizikai Kémia Tanszék, Kossuth Lajos Tudományegyetem, POB 7,
Egyetem tér, H-4010 Debrecen X, Hungary
#(TEL: +36 (52) 16 666. TELEX: 72200 UNIVK H) (19, 29, 31)

#BORZANI, Prof. W., Centro de Pesquisas, Instituto Mauá de Tecnologia,
#Estrada das Lágrimas 2035, 09500 São Caetano do Sul - SP, Brazil
#(TEL: 442 1900) (32)

BUTLER, Dr. L. R. P., Information and Research Services, Council for Scientific
and Industrial Research, PO Box 395, Pretoria 0001, Republic of South Africa
#(TEL: +27 (12) 869211. TELEX: 3-21312 SA) (28)

#DESHPANDE, Prof. D. D., Polymer Laboratory, Department of Chemistry,
#McGill University, 801 Sherbrooke Street West, Montreal, Québec H3A 2K6, Canada (23)

#HAECKEL, Prof. R., Institut für Laboratoriumsmedizin, Zentralkrankenhaus St.-Jürgen-Strasse,
#St.-Jürgen-Strasse, D-2800 Bremen 1, Federal Republic of Germany
#(TEL: +49 (421) 497 3640. TELEX: 2 44 804 SENAT D) (35)

NAKAJIMA, Prof. A., Department of Polymer Chemistry, Faculty of Engineering,
Kyoto University, Yoshida-machi, Sakyo-ku, Kyoto, 606 Japan
#(TEL: +81 (75) 751 2111. TELEX: 5422693 LIBKYU J) (23, 24)

PERRIN, Dr. D. D., Medical Chemistry Group, John Curtin School of Medical
#Research, Australian National University, PO Box 334, Canberra, ACT 2601, Australia
(TEL: +61 (62) 49 3526) (29, 30)

#RUBESKA, Dr. I., c/o UNDP, P.O. Box 7285 ADC, Pasay City, Metro Manila, Philippines
#(TELEX: RCA 72222250, EASTERN 63696 PH) (28)

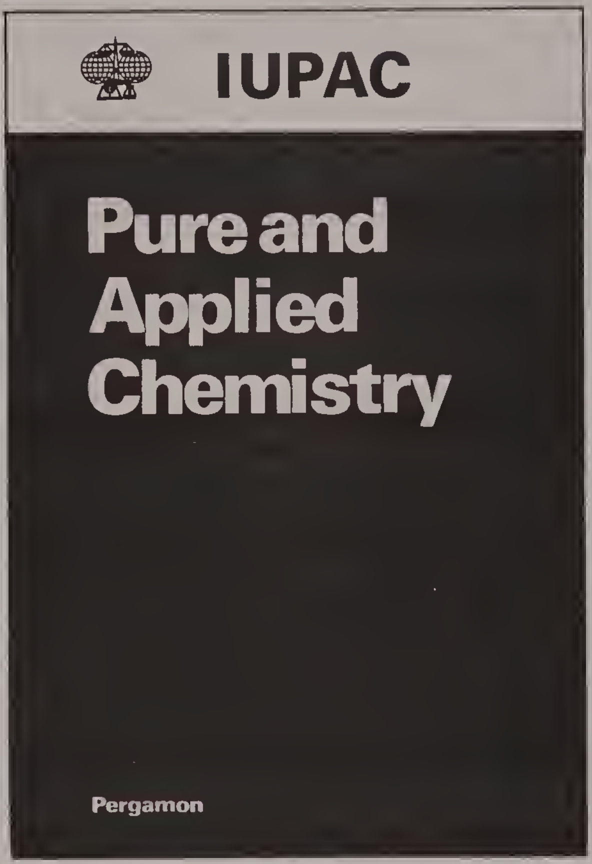
#SAITO, Prof. Kazuo, Coordination Chemistry Laboratories, Institute for
#Molecular Science, Myodaiji, Okazaki, Aichi-ken, 444 Japan
#(TEL: +81 (564) 51 4955. TELEX: 4537-475 KOKKEN J) (19)

#SAMUEL, Prof. D., Department of Pharmacology, Yale University School of Medicine,
#Sterling Hall of Medicine, POB 3333, New Haven, Connecticut, USA (11)

#SHIMOZAWA, Prof. J. T., Faculty of Science, Saitama University,
255 Shimo Okubo, Urawa, 338 Japan
(TEL: +81 (488) 52 2111) (11)

Deletion:

Prof. S.H. Yalkowsky (Tucson, Arizona)
Associate Member V.8 (1979-1987) [resigned]


IUPAC

Pure and Applied Chemistry

Pergamon

# PURE & APPLIED CHEMISTRY

Official Journal of the International Union of Pure and Applied Chemistry (IUPAC)

IUPAC Secretariat: *Bank Court Chambers,*
*2-3 Pound Way, Cowley Centre, Oxford,*
*OX4 3YF, UK*

*Pure & Applied Chemistry* is the interdisciplinary journal which publishes proceedings of conferences, IUPAC Nomenclature Rules and Commission Reports in all areas of chemistry. It rapidly publishes the plenary lectures presented at the international chemical conferences sponsored by IUPAC, usually within 3-6 months of the conference. In the past year *Pure & Applied Chemistry* has published lectures from many important conferences including the following:

6TH INTERNATIONAL SYMPOSIUM ON PLASMA CHEMISTRY, MONTREAL, QUEBEC, CANADA, 24-28 JULY 1983
29TH INTERNATIONAL SYMPOSIUM ON MACROMOLECULES, BUCHAREST, ROMANIA, 5-9 SEPTEMBER 1983
11TH INTERNATIONAL CONFERENCE ON ORGANOMETALLIC CHEMISTRY, CALLAWAY GARDENS, GEORGIA, USA, 10-14 OCTOBER 1983
12TH INTERNATIONAL CARBOHYDRATE SYMPOSIUM, UTRECHT, THE NETHERLANDS, 1-7 JULY 1984
14TH INTERNATIONAL SYMPOSIUM ON THE CHEMISTRY OF NATURAL PRODUCTS, POZNAN, POLAND, 9-14 JULY 1984

**Subscription Information**

| | |
|---|---|
| Published monthly (Volume 57) | |
| Annual subscription (1985) | **US$500.00** |
| Two-year rate (1985/86) | **US$950.00** |

**A selection of papers**

Organic mass spectrometry using the laser microprobe, D M HERCULES.
Trends in elemental analysis of organic compounds, E KOZLOWSKI.
Sampling and analysis of aerosols, F ADAMS.
Some aspects of the chemistry of alkyl and hydride derivatives of permethylscandocene, M E THOMPSON & J E BERCAW.
Reactive intermediates in organotransition metal chemistry, J C HAYES *et al.*
New developments in the organometallic chemistry of the group IV-VII transition metals, M L H GREEN.
Activation of dihydrogen and methane by photoexcited manganese and iron atoms in low temperature matrices, G A OZIN *et al.*
Elementary interactions between charged and neutral species in plasmas, D SMITH & N G ADAMS.
Conformations of macromolecules in condensed phases, P J FLORY.
Dilute block copolymer systems. Properties of oil-extended butadiene-styrene block copolymers, E CEAUSESCU & R BORDEIANU.
Soluble interpolymeric complexes as a new class of synthetic polyelectrolytes, V A KABANOV & A B ZEZIN.

---

FREE SPECIMEN COPIES AVAILABLE ON REQUEST
Advertising rate card available on request. Back issues and current subscriptions are also available in microform. Prices are subject to change without notice. Journal prices include postage and insurance. Sterling prices are available to UK and Eire customers on request.

**Pergamon Press**

Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

5A/8 5.84

## Chemistry International

is the news magazine of the

# INTERNATIONAL UNION of PURE and APPLIED CHEMISTRY (IUPAC)

---

*President:* W. G. SCHNEIDER *(Canada)*
*Vice-President:* C. N. R. RAO *(India)*
*Secretary-General:* T. S. WEST *(UK)*
*Treasurer:* A. BJÖRKMAN *(Denmark)*

**IUPAC Secretariat**
Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)

Telephone: + 44 (865) 717744
Telex: 83147 attn. IUPAC Telegrams: IUPAC OXFORD

---

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

to promote continuing co-operation among the chemists of the member countries;
to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
to co-operate with other international organizations which deal with topics of a chemical nature;
to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 45 countries, each represented by a national organization, such as an academy of science or research council.

---

NATIONAL MEMBER ORGANIZATIONS

Academy of Scientific Research and Technology (**Arab Republic of Egypt**)
Asociación Química Argentina (**Argentina**)
Australian Academy of Science (**Australia**)
Verein Österreichischer Chemiker (**Austria**)
Comité National Belge de Chimie (**Belgium**)
Associação Brasileira de Química (**Brazil**)
Bulgarian Academy of Sciences (**Bulgaria**)
National Research Council of Canada (**Canada**)
Chinese Chemical Society, and Chemical Society located in Taipei, China (**China**)
Ministerio de Minas y Petróleos (**Colombia**)
Academia de Ciencias de la República de Cuba (**Cuba**)
Czechoslovak National Committee of Chemistry (**Czechoslovakia**)
Det Kongelige Danske Videnskabernes Selskab (**Denmark**)
Suomen Kemian Seura (**Finland**)
Comité National Français de la Chimie (**France**)
Deutscher Zentralausschuss für Chemie (**Federal Republic of Germany**)
Akademie der Wissenschaften der DDR (**German Democratic Republic**)
Association of Greek Chemists (**Greece**)
Hungarian Academy of Sciences (**Hungary**)
Indian National Science Academy (**India**)
Iraqi Chemical Society (**Iraq**)
Royal Irish Academy (**Ireland**)
Israel Academy of Sciences and Humanities (**Israel**)
Consiglio Nazionale delle Ricerche (**Italy**)
Science Council of Japan (**Japan**)
Malaysian Institute of Chemistry (**Malaysia**)
Koninklijke Nederlandse Chemische Vereniging (**Netherlands**)
Royal Sociey of New Zealand (**New Zealand**)
Norsk Kjemisk Selskap (**Norway**)
Sociedad Química del Perú (**Peru**)
Polska Akademia Nauk (**Poland**)
Sociedade Portuguesa de Química (**Portugal**)
Korean Chemical Society (**Republic of Korea**)
Council for Scientific and Industrial Research (**Republic of South Africa**)
Academia Republicii Socialiste România (**Romania**)
Consejo Superior de Investigaciones Científicas (**Spain**)
Svenska Nationalkommittén för Kemi (**Sweden**)
Schweizerisches Komitee für Chemie (**Switzerland**)
Supreme Council of Sciences (**Syrian Arab Republic**)
Türkiye Kimya Dearneği (**Turkey**)
Academy of Sciences of USSR (**USSR**)
Royal Society (**United Kingdom**)
National Research Council, National Academy of Sciences (**USA**)
Instituto Venezolano de Investigaciones Científicas (**Venezuela**)
Unija Hemijskih Društava Jugoslavije (**Yugoslavia**)

# Chemistry International

IUPAC

## Contents 1984, No. 4 (August)

1 Editorial
2 Chemistry in UNESCO
11 Recent reports
13 IUPAC publications
14 Electroanalytical methods in clinical chemistry
19 Other people's publications
20 Sociedad Química del Perú
21 IUPAC report to ICSU 1983
24 The Israel Chemical Society
25 International Standards
27 IUPAC-sponsored Conferences
32 Golden Jubilee of the Indian National Science Academy
34 IUPAC people
35 Meeting of Executive Secretaries
36 Dijon—City and University
38 The State University of Ghent
41 International Association for Great Lakes Research
42 30th IUPAC Congress
43 IUPAC Conferences
46 Revisions to *IUPAC Handbook*

ISSN 019

Printed by The Nuffield Press Limited, Oxford.

# Chemistry International

he news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)

1984, No.5 (October)

Pergamon Press

# CHEMISTRY INTERNATIONAL

## The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Roger Fennell
PRODUCTION EDITOR: Richard J. Palmer

## EDITORIAL ADVISORY BOARD

*Chairman:* T. S. WEST *Secretary-General*
R. DEGAIN *Committee on Chemistry and Industry*
D. P. DEN OS *Committee on Publications*
L. PAOLONI *Committee on Teaching of Chemistry*
K. L. LOENING *Interdivisional Committee on Nomenclature and Symbols*
K. S. W. SING *Division I*
E. FLUCK *Division II*
N. J. LEONARD *Division III*
M. MANDEL *Division IV*
G. DEN BOEF *Division V*
L. E. COLES *Division VI*
D. B. TONKS *Division VII*
*Secretary:* R. W. FENNELL *Editor*

## SUBSCRIPTIONS

Six issues of *Chemistry International* will be published in 1985. Annual subscription rate including postage is US$20 for individuals, and US$40 for libraries. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, UK.

## REPRODUCTION OF ARTICLES

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*. Permission to reproduce articles will normally be granted at no cost to non-profit making bodies (such as National Adhering or Associated Organizations of IUPAC, National Chemical Societies, or International Scientific Unions). Permission for commercial publishers will normally be conditional upon publication of an advertisement for IUPAC publications. In all cases, please contact the IUPAC Secretariat for clearance.

Front cover: The Committee on Publications meets in Oxford. From left to right: Mr. T. H. G. Michael, Mr. P. D. Gujral (Secretary), Dr. D. P. den Os (Chairman), Dr. S. Marivčič, Dr. I. A. Williams, Dr. G. B. Munsch

Pergamon Press

Oxford New York Toronto Sydney Paris Frankfurt

© 1984 International Union of Pure and Applied Chemistry

# EDITORIAL

Opinions expressed here are those of the author, and do not necessarily reflect the views or policy of IUPAC

Although this issue once again contains some material with only tenuous connection with IUPAC there are also a number of items very much of IUPAC concern which I commend to you for study. The first is the Secretary General's Column (pp. 3–6) which brings you up-to-date with the problems confronting the Bureau and especially the Officers. By the time you read this the Bureau will have met, the Union will have decided on its official publisher for the next four years, it will be known whether funds are available to launch the Affiliate Membership Scheme and you may even have a new Editor — in which case, of course, this will be my last editorial and at least two people will heave a sigh of relief (see CI, 1983, No. 4, pp. 35, the second 'Reaction').

Being at the half-way stage of the IUPAC biennium there is the statutory requirement for Division Presidents to report to the Bureau on what their Divisions have (or have not) been doing since the previous General Assembly. Those available at the time of going to press are reproduced on pages 7–17. For a change no pictures this time but, in accordance with a favourable response in a sample survey, we have pen pictures (and photographs!) of two of the Presidents in a separate section. We hope, with the cooperation of those concerned, to work through them all before the next General Assembly — when there will be a very nearly complete new set! The season of even-year Committee and Commission meetings is now well under way and we have two summary minutes in this issue. Dare I venture to suggest that I shall be overwhelmed with summaries for the next issue. The flood of papers on the work of Committees and Commissions mentioned in my last editorial has not materialized but a slow flow is continuing, with articles from Commission V.6 (pp. 18–19) and CTC (pp. 37–39).

Another IUPAC item to which I want to draw your attention is the CHEMRAWN III Conference. I was unable to attend myself and was confidently depending on Dr. Harold Egan to provide a report for CI, as he did so well for CHEMRAWN II (CI, 1983, No. 1, pp. 26–29). Unfortunately, as many of you will by now have heard, Harold died in harness in The Hague. Following some furious activity at the Secretariat and the kind cooperation of those we were able to contact, I ended up with three similar, but slightly different, versions of what went on — all, of course, at the last minute. I have therefore taken the coward's way out and published all three separately, the first two verbatim, leaving you to form an overall impression for yourself.

In the last issue of CI we included, at the end, revisions to the *IUPAC Handbook* and organized the pages such that the revisions could, if you so wished, be cut out for sticking into your *Handbook* without serious damage to the magazine. I was expecting that this time there would be only one page of revisions, thus making my life easier. It turns out that there are 2½ pages so I am afraid that you will have to resort to other means than simple cut-and-paste to amend your *Handbook.*

In continuance of the recent diversification of material in CI to include the interactions of chemists and chemistry with the world at large, I am pleased to be able to publish three comments on the paper by Prof. Staab (CI, 1984, No. 3, pp. 2–5), all indicating that, although there are local variations, the problems outlined are by no means limited to the situations in West Germany; I am sure comments from outside Europe would be welcomed. Last but not least, I should like to draw your attention to the paper by Prof. Büchel (pp. 20–28) on the role of the chemical industry in helping to solve world problems, in particular with those in developing countries.

As I said earlier, this may be my last editorial. Since I started with the February 1983 issue I have, with the help and cooperation of my colleagues in the Secretariat and at Pergamon Press, introduced at one time and another various changes — in content, in format, in typeface. This is now the eleventh issue of CI in its 'new' form and I should like to end my eleventh editorial with a quotation from my first — "I should appreciate your comments and suggestions so that I can build up a picture of what *you* like or dislike, ready for the next permanent occupier of the editorial chair".

---

## Wrong again . . .

It has been pointed out that there is an error in the identification of the people in the photograph on p. 17 of CI, 1983, No. 6. Second from the left of the standing row is Prof. K. Kuchitsu, not Prof. K. Tamaru. I apologise to both these gentlemen for this mistake. To put the record even straighter, this means that the main caption is also wrong as Prof. Kuchitsu is not a member of the Physical Chemistry Division Committee — perhaps it should read "Most of the new . . . Committee".

There is also a classic mistake in CI, 1984, No. 3, p. 24 — the omission of a 'not'. In the section 'Mixtures of diastereoisomers' of the JCBN Newsletter, a 'not' should appear after 'would' at the end of line 4.

These are not, of course, the only errors that I have to announce. It appears that it was not 'our' Dr. White that received an award — IUPAC People, CI, 1984, No. 3, p. 32. However, you can imagine with what pleasure I accept the invitation to reproduce the following Erratum, from CODATA *Newsletter* No. 29, July 1984

> "With demeanor abject and posture penitential, the Editor acknowledges confusion of Howard J. White, Jr. with Guy K. White. It was the latter who received the Thermal Conductivity Award *(Newsletter* 27, page 1) and who should have been so credited. The former has claim enough to fame (see page 9 of this issue)."

Just to rub salt into the wound, I cannot resist adding that the feature on Dr. Howard White (and the CODATA Task Group on Chemical Thermodynamic Tables) starts on p. 10 of *Newsletter* No. 29, not p. 9! It is a great relief to find that I am in such erudite company.

**R. W. Fennell**

# THE SECRETARY GENERAL'S COLUMN

## Debate at Oxford

The IUPAC Executive Committee normally meets in the spring of each year to conduct the business of the Union between the annual Bureau and biennial Council meetings. This year, as announced in the Secretary General's Column (CI 1984, No. 1, pp. 2–3), the Executive Committee was unable to meet for financial reasons, so a two-day meeting of the Officers was held on 22–23 June at the Secretariat to prepare for the Bureau on 16–17 September. Some of the topics discussed there will be of interest to chemists active in IUPAC, the National Adhering Organizations (NAOs), the Company Associates (CAs) and others. The Bureau will, of course, have to decide whether or not to approve the Officers' thoughts on these matters.

## Draft proposals for changes to Statutes

As mentioned in the report on the General Assembly at Lyngby in 1983 (CI, 1983, No. 6, pp. 2–10), the Council approved a revised Leuven dues structure based on a mathematical formula to relate the national subscriptions (dues) of member countries to their chemical turnovers (CTs). However, there was confusion over the way in which this could be related to the number of votes assigned to each country according to the Union's present Statutes and Bylaws, so full implementation of the approved dues stucture had to await resolution of this problem.

The situation according to the present Statutes is that each member country, upon admission to the Union, chooses a category of membership (Statute S3.3) with the appropriate number of Delegates (S5.1) to the Council. These are Category $A_1$, $A_2$, $A_3$, six Delegates (votes); Category $B_1$, $B_2$, etc., four Delegates; Category C, two Delegates; and Category D, one Delegate. The reasons for banding $A_1$, $A_2$, $A_3$, is related to the traditional three levels of annual subscription in Category A, etc. The Council decides from time to time (S9.1) the minimum amount of subscription for each category of membership. Each Delegate has a vote which is exercised individually on scientific matters. In non-scientific, i.e. policy matters, voting is by Delegation and Category D members are unable to vote. The difficulty that faced the Council in 1983 was that it was unclear how the revised dues structure, which provides for individual specific minimal membership subscriptions for each country, would be related to the number of votes which were previously arranged by banded fixed subscriptions.

The proposal that the Officers will make to the Bureau first of all adopts the important principle that, in transfer to the new structure, no existing member country will lose the voting status accorded by the previous system. Secondly, it proposes that the former Category D countries will in future be able to vote on non-scientific matters. This will eliminate an anomaly in relation to policy-making within IUPAC for some member countries. It will not, of course, affect Observer countries which will, as before, have no voting rights.

The essential change proposed for Statute 3.3 is that it will no longer mention categories of membership since such categorization will no longer be applicable. A country requesting admission to the Union will simply provide full information about its proposed NAO. Statute 5.1 will essentially say that each Delegation shall be assigned a specific number of votes (1–6) according to principles decided by Council. If the Bureau accepts these suggestions in September, the recommended detailed changes to the Statutes, and the principles by which the number of votes will be assigned within the revised dues structure, will be communicated to all NAOs in October. As mentioned above, no country will lose votes according to its previously assigned category of membership, but quite a few will gain, and those countries with one vote will now be able to vote on policy as well as scientific matters.

Member countries would be allocated votes as follows if the revised dues structure and revised Statutes had been in operation in 1984:

| CT (US$$10^9$) | National Subscription (US$$10^3$) | Delegation Votes |
|---|---|---|
| ⩾ 25 | ⩾ 20 | 6 |
| 10 – 24 | 9.5 – 19.5 | 5 |
| 4 – 9.5 | 5.0 – 9.0 | 4 |
| · | · | · |
| · | · | · |
| · | · | · |
| 0.6 – 0.9 | 0.6 – 1.1 | 1 |

The important difference between the revised structure and the old one is that each national subscription is calculated individually and is not likely to vary much from year to year — unless there is a marked change in a country's CT. Furthermore, it may be advantageous for some NAOs near the upper end of a voting level to pay only US$500 more and gain an extra vote; in the lower range the difference may only be US$100.

There are, of course, several other minor consequent changes that need to be made to other Statutes and Bylaws to bring them into conformity with the proposed changes to S3.3 and S5.1. The Lyngby voting categories, Statutes and Bylaws will have to continue in operation until the end of the Lyon General Assembly, according to S14.1.

Delegations will have to bear in mind that changes to the Statutes can only be made with the approval of two-thirds of the total number of votes *assigned* to NAOs in the present Categories A, B and C (S14.3). It is therefore important for all member countries to be present and to vote at the Assembly.

## Limitation in length of service on IUPAC Commissions and Division Committees

The Council in Lyngby heard of proposals from a subcommittee, chaired by Prof. Heini Zollinger, to alter Bylaw B4.304 to stipulate that exceptional circumstances must be established to permit consecutive membership in any capacity of two or more Commissions of the same Division or of different Divisions, or of two different Division Committees, beyond twelve years. Further discussion by the Officers of the proposals to be recommended to the Bureau has centred around

(1) whether service on two bodies is consecutive or simultaneous,

(2) whether broken membership periods should count, and

(3) clearly stipulating that the Bylaw does not apply to coopted persons or National Representatives.

The proposal now to be submitted to the Bureau for its consideration will stipulate that —

> Exceptional circumstances must be established and special permission of the Bureau granted for membership in any capacity, other than that of a coopted person or a National Representative, of two or more Commissions of the same Division, or of different Divisions, beyond twelve years, consecutive or not.

A similar alteration to B4.103, relating to Division Committee membership, limiting the total period of membership of more than one Division Committee to twelve years, whether the periods of membership are consecutive or not, will also be put before the Bureau.

The proposals of Prof. Zollinger's Subcommittee were operated as guidelines by the new Bureau in 1983 when it met after the Council meetings to consider appointments to Commissions and Division Committees. Where there were sufficiently convincing arguments of exceptional circumstances, some Commission members had their length of service extended. However, since the new twelve-year restriction is not yet an accepted Bylaw, the officers accepted the wording of the present Bylaw (B4.304) which makes initial appointments for four-year periods of service. Thus the individuals concerned — and there were very few of them — had their service extended to 1987. The Officers have resolved to recommend to the Bureau that this decision should be confirmed but that, in future, the twelve-year limitation clause should have precedence.

## Message for Officers of Commissions and Divisions

At Lyngby the Council expressed itself in favour of the twelve-year limitation to length of service, but the appropriate changes to the Bylaws could not be made because such changes require that a minimum of eight months' prior notice should be given to the NAOs before an Assembly. It is expected that these changes will be made by the Council at Lyon in 1985. Since they become operative immediately after the end of the General Assembly, they will be in operation when the new Bureau meets to consider Commission and Division Committee memberships for 1985 onwards.

It is important, therefore, that all Officers of Commissions and Divisions should realize that:

(1) The normal length of service of a Titular Member of a Commission is eight years, i.e. two periods of office of four years whether or not such service is consecutive. A Commission may request the Bureau through its Division President for an extension of service of two years for exceptional reasons. It is not the Officers' intention that this should be changed.

(2) The new limitation to twelve years applies to total length of service as Associate *plus* Titular membership within a particular Commission.

(3) The twelve-year limitation also applies to total Titular and Associate membership in more than one Commission of the same Division or of more than one Division.

It is important that the Officers of Commissions and Divisions should check length of service with the Secretariat before proposing extensions beyond eight years. This point is also of critical importance where Commission Officers, i.e. Chairmen, Vice-Chairmen or Secretaries, are proposed for extension beyond normal service (10 years). Should it not be possible for an extension to be given by the Bureau there could be a period when, for example, a Commission would be leaderless.

It is emphasized that the restriction of total length of service as a Titular and/or Associate

Member of a Commission has no relevance to subsequent service on a Division Committee or other higher body of the Union. The value to the Union for experienced members of Commissions to be able to serve subsequently on Division Committees, etc., is undisputed.

As far as service on Division Committees is concerned, there is at present (B4.103) a service limit of four consecutive years as an ordinary Member. Also, the sum of the years as an ordinary Member and as President/Past President/Vice-President/Secretary shall not exceed ten years. The new twelve-year regulation will enable a person to serve for a total of up to twelve years on different Division Committees.

## Optimistic outlook for restoration of Commission membership

During recent years Commissions have had their Titular membership restricted to six, as opposed to eight, and Division Committees have been limited to eight instead of the normal ten Members. After studying the current financial situation, the Officers noted with satisfaction, and relief, that if the 1984 and 1985 budgetary forecasts were fulfilled it should be possible, with effect from the end of the Lyon Assembly, to lift these restrictions. Commissions and Divisions could then return to a normal quota of members from 1985. Although the work of Commissions has been protected during the past few years by encouraging recruitment of up to twelve Associate Members, nevertheless Commission meetings have almost become of sub-critical size and problems of representation, both with regard to discipline and geography, are becoming apparent in some cases.

## *IUPAC Handbook*

The new *IUPAC Handbook 1983–1985,* produced on the recently installed word processor at the Secretariat, was received ‘hot off the press’ by the Officers and should now be in the hands of all IUPAC bodies. Not only does it contain the usual information on NAOs, CAs, Division and Commission memberships and alphabetical address listing, but also the Current Programmes 1984, Guidelines for IUPAC Projects, and the revised procedure for comment and approval of nomenclature recommendations, with a list of the National/Regional Centres from which copies may be sought by interested persons. There are also lists of reports published in 1983 by Divisions and of forthcoming IUPAC-sponsored symposia as well as the Lyngby Council Minutes and the Budgets for 1984 and 1985. The Secretariat had hoped to include a ten-year listing of published Commission reports, with a subject index, but shortage of staff and word processor problems frustrated its achievement. Nevertheless, the amount of information now included in the *Handbook* is impressive and should be of considerable benefit to all those associated with the Union.

## Official publisher to the Union

As usual at the end of the period of appointment of the official publisher to the Union, tenders were invited from various publishers, including the present publisher, Pergamon Press. The recommendations of the Publications Committee on the tenders received were considered by the Officers, who noted the position and agreed on the composition of a subcommittee to meet and hold discussions with selected publishers in August, when a final decision will be made. The new publishing contract will run from January 1985 until December 1989. Naturally, the Union will be anxious to secure the maximum possible dissemination of its publications consistent with securing the financial return necessary to meet the publications budget of the union. It should be possible to make an announcement of the name of the publisher in the next issue of *Chemistry International* (CI).

## Hopes for launch of Affiliate Membership Scheme: Help from the NAOs

In the previous Secretary General’s Column I reported that the Officers had decided to try to secure sufficient funds from sources outside IUPAC to be able to implement the Affiliate Membership Scheme, with effect from January 1986, at no cost to the Union. I am happy to report that we have now received offers of financial assistance amounting to about US$25,000 from the NAOs of Japan, UK, USA and the International Council of Scientific Unions (ICSU). UNESCO has promised to consider funding to support launching the Scheme in developing countries and a charitable institution is also considering an appeal, as are the NAOs of Canada, France and Denmark. The Officers have not as yet approached the NAOs of countries other than their own, but would gladly welcome offers of support on a ‘once only’ basis to help underwrite the setting up of the Scheme.

Decisions on the major appeals should be available in September at which time, if sufficient funds have been obtained, the Bureau will be asked to allow recruitment of the necessary staff to start arrangements for consultation with the NAOs and Chemical Societies in member countries and the appropriate centres in non-member countries.

### No more *Chemistry International* ?

Meanwhile, it should be noted by all concerned that *if* sufficient funds or pledges for 1985 for the Affiliate Membership Scheme are not forthcoming this year, it may not be possible for the Union to continue publishing CI beyond December 1984. The Union will then lose its main means of communicating with NAOs, CAs, its Commission members and Divisions, and others interested in the Union. There is likely to be no CI in 1985 because the Council only budgeted for a part-time Editor for 1984–1985. We have therefore only been able to continue with publication of CI because of the goodwill of Mr. Roger Fennell, a former Secretary of Division V, who kindly agreed to help us out on a part-time basis for a limited period of time. That time, already extended, finally runs out in December 1984 and we have insufficient funds to acquire a full-time Editor for 1985 — unless, as we earnestly hope, the Affiliate Membership Scheme funding appeal succeeds.

### Postscript — Whatever next?

Readers of this Column may have noted in the photograph accompanying the previous one (CI, 1984, No. 1, p. 3) that the Officers were seated deep in discussion around a table with upturned empty (water) glasses. They may also have noted that President Bill Schneider was reported to have succumbed to some food poisoning and that the article itself was rather sombre in general outlook. Although ending above on a warning note, this Column does carry, I trust, a brighter picture all round. The Divisions have had supplementary funds allocated in addition to those granted in December 1983; it looks as if they will be able to return to their normal membership complements in 1985; the funding appeal for the Affiliate Membership Scheme looks promising; the *Handbook* is a splendid production and appeared, despite its complexity, within a year of the General Assembly — and, this time, Bill Schneider was not poisoned in Oxford.

---

## IUPAC PEOPLE

### We congratulate:

**Mr. S. G. Luxon** (IDCNS, Division VI Committee) on being presented with the YANT Award by the American Industrial Hygiene Association — "for outstanding contributions in industrial hygiene or allied fields to an individual residing outside the USA."

**Prof. P. Yates** (former President of Division III) on the award of the Chemical Institute of Canada medal for his contribution to chemistry in Canada.

**Prof. A. S. Kertes** (Commission V8) on the receipt of the triennial International Solvent Extraction Conference Award — "for outstanding accomplishment and meritorious achievement in solvent extraction."

### We regret to record the death of:

**Dr. L. C. Cross,** UK (7 June 1984) — Commission on Nomenclature of Organic Chemistry (1963–1981), Commission on Macromolecular Nomenclature (1968–1979), Committee on Publications (1969–1977).

**Dr. H. Egan,** UK (28 June 1984) — President, Applied Chemistry Division (1973–1977), Applied Chemistry Division Committee (1971–1979, 1981—), Section on Food (1967–1973), Coordinating Committee on Analytical Methods for CEE and IARC (1969–1978), Committee on SCOPE (1971–1981), CHEMRAWN Committee (1976—), IDCNS (1975–1979, 1983—), CI Editorial Advisory Board (1983—).

**Prof. G. F. Kirkbright,** UK (8 July 1984) — Commission on Analytical Nomenclature (1971–1981), Commission on Spectrochemical and Other Optical Procedures for Analysis (1981—).

# DIVISION PRESIDENTS' REPORTS TO THE BUREAU

## OXFORD, 16–17 September 1984

Division Presidents are required by IUPAC Bylaw B4.109 to present an annual report to the Bureau. Those to be presented at the Bureau meeting in Oxford this year, and which are available at the time of going to press, are reproduced below.

## I. PHYSICAL CHEMISTRY DIVISION

I.1. Commission on Physicochemical Symbols, Terminology and Units.
I.2. Commission on Thermodynamics.
I.3. Commission on Electrochemistry.
I.4. Commission on Chemical Kinetics
I.5. Commission on Molecular Structure and Spectroscopy.
I.6. Commission on Colloid and Surface Chemistry including Catalysis.

### General Division activities

Significant structural changes in the Physical Chemistry Division, which were decided in Lyngby, have been implemented. The new Commission on Chemical Kinetics (I.4) has been set up and members appointed. A Division Subcommittee on Physicochemical Measurements and Standards has been established to complete the work of the previous Commission of the same name.

To follow up the vigorous discussion at Lyngby on the IUPAC recommendation for a change in the standard state pressure, the President wrote to a number of journal editors and textbook authors explaining the IUPAC action. Authors were encouraged to convert to the new standard and to state clearly their convention. Comments from editors and authors were also solicited; several responses have already been received.

### Commission activities

**Commission I.1**

A first draft of the revised 'Green Book' is in preparation, and a master list of physicochemical symbols to be used in the book has been prepared. The second draft of the abbreviated version of the Manual, which will contain the most commonly used symbols and units, is now being circulated. The target for producing a final draft is September 1984.

The Commission has continued its routine review of all documents from other Commissions to check consistency in the use of symbols, terminology, and units. Extensive comments have been made on several documents.

**Commission I.2**

The Commission will meet in August at Hamilton, Canada, in conjunction with the International Conference on Chemical Thermodynamics, to review and discuss documents on *Standard states of mixtures* and the thermodynamics sections of the new version of the 'Green Book'. The controversy over the change in standard state pressure will also be discussed, and explanatory documents on this topic will be finalized.

A successful meeting of the Subcommittee on Transport Properties was held in London in March. The first data compilations resulting from this project have been completed, and several others are in an advanced state. The Subcommittee on Thermodynamic Tables has also been active and has established a joint effort, with a related CODATA body, to hold a workshop on fluid property compilations in September 1985.

**Commission I.3**

Several documents have progressed. *Recommendations on reporting electrode potentials in non-aqueous solvents* was published in final form in PAC in April 1984. This will be reprinted in *Electrochimica Acta* to obtain wider distribution among electrochemists. A document *Interphases in systems of conducting phase* has been revised in the light of comments received on the provisional publication. Another document *The absolute electrode potential. An explanatory note* has been circulated within the Division and is now being revised for final submission. Finally, the major data compilation *Oxidation-reduction potentials in aqueous solution* has been completed and is now being reviewed within the Division.

A meeting of a subgroup of the Commission has been set for November 1984 to finalize the document *Corrosion nomenclature.*

**Commission I.4**

The appointment of the members of this new Commission has just been completed and the first organizational meeting will be held at the Lyon General Assembly.

**Commission I.5**

The document *Names, symbols, definitions, and units of quantities in optical spectroscopy,* which represents a long-standing joint effort of Commissions I.5 and VII.2, has been completed and submitted to the Secretariat. Another document *Symbols, terminology, and applications for electron spectroscopies* has completed Division review. Two other reports, *Specifications for infrared reference spectra of materials in the vapor phase above ambient temperature* and *Test data for normal coordinate calculations* are in the last stage of review.

Plans have been completed for a meeting of the Subcommittee on Notations and Conventions for Molecular Spectroscopy to take place in Ottawa in the fall of 1984.

### Commission I.6

The document *Reporting experimental pressure–area data with film balances* has gone through its final revisions and is being prepared for publication. Another document *Reporting physisorption data for gas/solid systems* is approaching completion. Progress has also been made with *A Lexicon of experimental techniques in surface chemical physics.*

A meeting of the Subcommittee on Catalyst Characterization was held in Berlin in July to prepare the first draft of a manual *Principles of catalyst characterization.*

**David R. Lide, Jr.**

## III. ORGANIC CHEMISTRY DIVISION

- III.1. Commission on Nomenclature of Organic Chemistry.
- III.2. Commission on Physical Organic Chemistry.
- III.3. Commission on Photochemistry.
- III.4. Commission on Medicinal Chemistry (Suspended 1981).

### Organization and sponsorship of scientific events

The organization of forthcoming symposia of major interest for the Division Committee up till 1986 have been defined, with the exception of the Organic Synthesis Congress which should be held in Moscow, USSR, in the summer of 1986. For a few events even further ahead preliminary planning has already been done (see Appendix).

The sponsorship for other scientific events has been either requested or granted.

### Commission activities

The Division has three Commissions fully active in their specific fields. There is little to report of activities since the Lyngby General Assembly as the Commissions will not meet until late this summer. If possible a more up to date report will be tabled at the Bureau Meeting in Oxford.

### Commission III.1

The Commission will meet at Montreal at the end of July. Progress has been made on almost every project; they will be revised at Montreal and some reports will probably be submitted for provisional publication.

### Commission III.2

The Commission's work is following the plan already set out. The Commission will meet at Burlington, Vermont, USA, in August soon after the meeting of the joint (III.1/III.2) Working Party on Stereochemical Terminology. At these meetings the progress of the Working Groups will be reviewed.

### Commission III.3

The Commission will meet at Interlaken, Switzerland, at the end of July where progress on the projects will be reviewed. Significant advancement is expected on the compilation of the Glossary which will probably be released for publication. Also a few new drafts on the other projects would be ready for discussion at that meeting.

### Working Group on Medicinal Chemistry

The final report of the Working Group is not yet available. However, from preliminary documents and personal information, it emerges that the gap between the ICMC group and other medicinal chemists willing to collaborate with IUPAC, by reconstituting a Commission III.4 or something equivalent to it, has not been closed. It is based, in my opinion, on different interpretations of the role and aims of IUPAC. Indeed since the time of the Constitution of the *Section* of Medicinal Chemistry and of its transformation into Commission III.4, rather than into a Division as they wished, relations between IUPAC and this group have not been easy.

A reexamination of the instructions to the Working Group might be appropriate.

**G. Modena**

APPENDIX — Symposia of Interest to Division III

| | Title of Symposium | Organizer | Division Representative | Other Interest or Comment |
|---|---|---|---|---|
| 1–7 July 1984 | 12th International Carbohydrate Symposium, Utrecht (Netherlands) | J. F. G. Vliegenthart | A. Handel | Sponsored |

| | Title of Symposium | Organizer | Division Representative | Other Interest or Comment |
|---|---|---|---|---|
| 9–14 July | *14th International Symposium on Chemistry of Natural Products, Poznan (Poland) | M. Wieviorowsky | N. J. Leonard | Sponsored |
| 22–27 July | 10th International Symposium on Photochemistry, Interlaken, Switzerland | D. G. Whitten | F. C. de Schyver | Sponsored |
| 20–24 August | *7th IUPAC Conference on Physical Organic Chemistry, Aukland (New Zealand) | B. R. Davis | H. Zollinger | Sponsored |
| 27–30 August | *5th International Conferences on Organic Synthesis, Freiburg (Germany) | H. Prinzbach | I. Beletskaja | Sponsored |
| 27–31 August | *8th International Symposium on Medicinal Chemistry, Uppsala (Sweden) | G. L. G. Nilsson | S. Sarel (?) | Sponsored |
| 27–31 August | International Symposium on Carotenoid Chemistry, Münich (Germany) | W. Rom | B. C. L. Weedon | Sponsored |
| 9–14 September | Organo silicon Chemistry, Kyoto, Japan | M. Kumada | Selection in progress | Sponsored |
| Early June 1985 | *Bioorganic Chemistry, New York (USA) | R. Breslow | | Sponsored |
| 15–19 July | Novel Aromatic Compounds, St. Andrews (UK) | P. J. Garrat | | Sponsored |
| 12–15 July | *3rd Congress on Organometallic Chemistry directed toward Organic Synthesis, Kyoto (Japan) | H. Nozaki | | Sponsored |
| 11–16 August | 10th International Congress on Heterocyclic Chemistry, Waterloo (Canada) | V. Sniekus | | Sponsored |
| 2–5 September | Application of Mathematics to Chemistry, Dubrovnik (Yugoslavia) | N. Trinajstic | | Sponsored |
| 2–6 September | 5th Symposium on Marine Natural Products, Paris (France) | P. Potier and D. H. R. Barton | | Sponsored |
| 10–13 November | International Congress on Organic Chemistry of Medicinal Natural Products, Shanghai (China) | Yu. Wang | | Sponsored |
| 1–6 June 1986 | *Organic Chemistry of Technological Processes, Jerusalem (Israel) | VOFSI | | |
| 17–23 August | *15th International Symposium on Chemistry of Natural Products, The Hague (Netherlands) | U. K. Pandit | | Sponsored |

| | Title of Symposium | Organizer | Division Representative | Other Interest or Comment |
|---|---|---|---|---|
| | *6th International Conference on Organic Synthesis, Moscow (USSR) | N. K. Kotchekov | | |
| 24–29 August | *8th IUPAC Conference on Physical Organic Chemistry, Tokyo (Japan) | M. Oki | | |

*Symposia promoted by the Division

## IV. MACROMOLECULAR DIVISION

IV.1. Commission on Macromolecular Nomenclature.
IV.2. Commission on Polymer Characterization and Properties.

### General activities

The following symposia have been held since the General Assembly at Lyngby, or are planned to take place before the end of 1984.

1983
6th International Symposium on Cationic Polymerization, Ghent, Belgium, 30 August–2 September.
29th International Symposium on Macromolecules, Bucharest, Rumania, 5–9 September. This was a multi-topic symposium attracting participants from 32 countries; from a total of about 920, 360 came from abroad.

1984
International Conference on Physics and Chemistry of Low-dimensional Synthetic Metals, Abano Terme, Italy, 17–22 June.
6th Bratislava International Conference on Modified Polymers, Bratislava, Czechoslovakia, 2–5 July.
26th Prague Microsymposium on Polymers in Medicine and Biology, Prague, Czechoslovakia, 9–12 July.
27th Prague Microsymposium on Physical Optics of Dynamic Phenomena and Processes in Macromolecular Systems, Prague, Czechoslovakia, 16–19 July.
International Symposium on Physical Chemistry of Colloids and Macromolecules, Uppsala, Sweden, 22–24 August. Symposium to celebrate 100th anniversary of the birth of Professor The(odor) Svedberg.
Symposium on Polymer Chemistry, Leuven, Belgium, 26–28 September. Symposium organized in honour of Prof. G. Smets.

Prof. M. Mandel attended a meeting of the CHEMRAWN Committee in the Hague on 30 June.

An informal meeting of the Division Committee was held in Prague between the 26th and 27th Microsymposia, on Friday, 13 July.

### Commission activities

#### Commission IV.1

Following the meeting of Commission IV.1 at the General Assembly in Lyngby, two substantial documents were prepared for publication and submitted for processing via the new procedure presented at Lyngby: these are *Source-based nomenclature for copolymers* and *A classification of linear single-strand polymers.* The Commission also agreed on the wording of a *Note on the terminology for molar masses in polymer science.*

The compilation of the comprehensive compendium of macromolecular nomenclature covering both synthetic and natural polymers is almost complete. It is anticipated that this will be finalized during the summer of 1984.

Working parties on the three sub-sections of the next main document of the Commission — *Physical terms relating to polymers* — have been proceeding by correspondence; in the case of the Dilute Solutions sub-section, this has greatly been assisted by a meeting in Uppsala between the Convenor, Dr. Kratochvil, and one of the other members, Prof. Sundelöf. Prof. Allegra has circulated for comment a completely revised draft of the proposals for nomenclature of crystalline polymers, and this should be ready for completion at the next meeting of the Commission.

Following a decision taken in Lyngby, a Working Party on Recommended Abbreviations has been set up under the Chairmanship of Prof. D. Braun and this group is expected to present a preliminary report at the next meeting.

The Commission will convene in Prague during the period 5–8 September 1984.

#### Commission IV.2

The Commission will hold a meeting, hosted by Rhone-Poulenc, in Paris during 27–28 September 1984.

**Working Party IV.2.1** on Structure and Properties of Commercial Polymers. The meeting of the Working Party during 1984 will be in Wilmington, Delaware, USA, 2–4 October and will be hosted by du Pont. Membership in North America is extending to include the Boeing Aircraft Corporation and the University of Waterloo, Canada.

IV.2.1.1. This is the subgroup of the main working party located in Japan. It continues to show high activity and submitted the following report to PAC in May 1984: *Viscoelastic properties of rubber-modified polymeric materials at elevated temperatures.*

A programme of work on Structure and Properties of Linear Low-Density Polyethylene (LLDPE) will be complete by the end of the year. The subgroup in Eastern Europe (IV.2.1.2.) (see below) has cooperated in carrying out light scattering measurements on LLDPE samples.

In addition, the following topics are being studied:

1. Long-term Ageing Effects on Mechanical Properties of Commercial Polymers.
2. Physico-Chemical Properties of Commercially Available Carbon Fibres.
3. Structure and Properties of High-Vinyl Polybutadiene Rubber and its Blends.
4. Structure and Dielectric Properties of Vinylidene Fluoride Copolymers.

IV.2.1.2. This is the subgroup of IV.2.1. in Eastern Europe (see Divisional Report to Council, 1983). It was inaugurated on 15 July 1983; since that time its membership has extended to four members: J. Stejskal (Czechoslovakia); P. Szewczyk (Poland); J. Kucera (Czechoslovakia); F. A. Shutov (USSR); membership of Dr. Piglowski from Poland is under consideration.

In 1983–1984 the subgroup contributed to the molecular characterization of polyethylene samples studied by Working Party IV.2.1 in the project Extrusion Instabilities of Polyethylene. The subgroup has also participated in the characterization of linear low density polyethylene studied by subgroup IV.2.1.1. (Prof. A. Nakajima). Several samples of LLDPE were characterized to contribute to the activities of Working Party IV.2.2. (Mr. P. Starck).

Plans for future work:

(1) This subgroup would like to participate in the new projects carried on by Working Party IV.2.1. No such projects were started in 1983, but the proposals Mechanical Characterization of Long Carbon Fibre Thermoplastic Composites, Impact Toughness, and Mechanical Behaviour of Polyolefin Films would be of interest. The matter will be clarified at the Wilmington meeting of Working Party IV.2.1. which Dr. P. Szewczyk will attend as the subgroup representative.

(2) The subgroup will meet informally in September 1984 (Brno, Czechoslovakia) to discuss the future cooperation with IUPAC bodies, especially with Working Party IV.2.1.

(3) The subgroup has recently invited members of Working Party IV.2.1. to hold their 1985 meeting (and a joint session with this subgroup) in Prague, Czechoslovakia, on the occasion of the 28th Prague Microsymposium on Polymer Composites.

**Working Party IV.2.2** on Molecular Characterization of Commercial Polymers held a meeting on 17 May in Gothenburg, Sweden. A report has been published on *Molecular characterization of ethylenepropylene block copolymers.*

**Working Party IV.2.3** on Supported Polymer Films. A meeting of the Working Party concerned with the discussion of new projects will be held in Lugano, Switzerland on 25 September 1984, alongside the FATIPEC Congress.

**Working Party IV.2.4** on Thermal Properties of Polymers. A report is being prepared on glass transition phenomena in polystyrene based on 15 reports received from members of the Working Party.

**Working Party IV.2.5** on Kinetic Parameters for Free-Radical Polymerization held a meeting in Mainz in April 1984 at which progress was reviewed and reports and the future programme planned.

It was agreed that the present programme of experimental work will be substantially complete by the summer of 1984 and will be terminated then. Reports on this work will be written and published. Problems in industrial laboratories associated with maintaining momentum in an experimentally-based scientific programme which does not have immediate commercial relevance were highlighted, and it was decided that the content of experimental work in a new programme should be minimal.

The new programme will be submitted to the General Assembly in Lyon, 1985.

**New Working Parties.** Commission IV.2 comprises Working Parties which carry out experimental investigations in many fields of polymer science, most of which have rather direct commercial relevance. These studies are aimed at promoting wider and more effective use of polymeric materials. Increasing knowledge and technological advances leading to new applications will naturally be reflected in changes and probable expansion in the activities and numbers of Working Parties. This is a matter for continuous assessment by the Commission.

At the General Assembly in Lyngby two topics for new Working Parties were selected from a number of proposals: Biocompatibility of Polymers, and Liquid Crystalline Systems. Both are connected with current and projected commercial developments of great importance. The feasibility of setting up Working Parties in these areas has been explored by Profs. C. H. Bamford and N. Platé and developments will be reported fully at the Commission meeting in Paris.

Lively and valuable discussions of possible IUPAC activities in the field of biocompatibility of synthetic polymers were held in Prague on 11 and 13 July, on the occasion of the 26th Microsymposium on Polymers in Medicine and Biology. Preliminary arrangements for setting up the Working Party were formulated. The proposal was received with enthusiasm by the experts present, and the importance of introducing 'biological' activities into the Macromolecular Division was emphasized.

**C. H. Bamford**

# V. ANALYTICAL CHEMISTRY DIVISION

V.1. Commission on Analytical Reactions and Reagents.
V.2. Commission on Microchemical Techniques and Trace Analysis.
V.3. Commission on Analytical Nomenclature.
V.4. Commission on Spectrochemical and other Optical Procedures for Analysis.
V.5. Commission on Electroanalytical Chemistry.
V.6. Commission on Equilibrium Data.
V.7. Commission on Analytical Radiochemistry and Nuclear Materials *(under review)*.
V.8. Commission on Solubility Data.

The purpose of this report is to review the activities of the Division of Analytical Chemistry since the 32nd General Assembly (Lyngby 1983) and up to 1 July 1984. The synthetic aspect of the work carried out by the eight Commissions of the Division and its place and importance in the context of the development of analytical chemistry will not be considered here; to take advantage of a longer time frame, these aspects will be developed in the report to be prepared for the General Assembly in Lyons in 1985. Nevertheless, certain new directions which have been the subject of reflexion within the Division and its Commissions will be mentioned, with a view to the discussion and programming of new projects.

## 1. General activities

**1.1** The Divisional Committee has played its usual role in the examination of the work of the Commissions with a view to its forwarding for publication, via IDCNS if necessary. A certain speeding up of the various studies has been observed due to the fact that the Members of the Divisional Committee predominantly follow the work falling within their respective scientific fields and have taken part in the elaboration or development of projects in the course of publication. A speeding up of the clearing process, without prejudice to the quality of reviews, could, however, certainly be achieved. The Executive Committee of the Division (Chairman, F. Pellerin; Vice-Chairman, G. Nancollas; and Secretary, G. den Boef) will meet prior to the General Assembly to draft proposals to be examined by the Divisional Committee in Lyons.

### 1.2 Division projects

The three projects co-ordinated by the Division have progressed satisfactorily since September 1985.

**1.2.1 Orange book.** The second edition of the *Compendium on Analytical Nomenclature* (Orange Book) is nearly ready for printing. The coordinator, Prof. H. Freiser, has assembled various documents and updated certain chapters in liaison with the Vice-Chairman, G. Nancollas. The provisional report on the pH scale will become the final entry before the volume is sent for printing.

**1.2.2. Methods for the determination of trace metals and metalloids in natural waters.** After numerous difficulties, this study, which involves the work of all the Commissions of the Analytical Chemistry Division, will be completed by the end of July 1984 with the presentation of a series of articles that could be incorporated into a first volume. Prof. Nurnberg, the coordinator of the project, has assembled four documents submitted by the Commissions:

*V.1 — Spectrophotometric methods for determination of trace elements in natural waters.*
*V.5 — Voltammetric methods for the trace analysis of heavy metals with exotoxic significance in natural waters.*
*V.5 — Electroanalytical measurement of trace metal complexation in natural aquatic conditions.*
*V.6 — General aspects of trace metal speciation in natural waters.*
*V.7 — Determination of trace elements in natural waters by neutron activation analysis.*

Material for a second volume, emanating from Commission V.4 and on the subject of *Spectroscopic Methods for Trace-element Determination in Natural Waters,* will be ready very soon.

The manner of presentation could, at first sight, seem disparate. The Division has assembled a collection of reports by the Commissions. To assemble and synthesize all accumulated data would represent a great deal of work and time and would be, moreover, beyond available financial resources.

Finally, it was decided that the 'Water Project' should be presented by group or type of method rather than element by element. This solution has the advantage of displaying the work carried out by each Commission; also, the reader will be able more easily to choose the method he can use as a function of the instruments available to him and the sensitivity required. In this form it would seem that the publication will provide a service to the analytical chemist and offer vast documentation on the theoretical and applied aspects of the analysis of trace elements in natural waters and in the various domains of chemistry, of life and of the environment in which these problems arise. As soon as the Bureau and the Executive Committee of the Union have approved the camera-ready copy, the means of publication can be decided.

**1.2.3** ***Multilingual Dictionary*****.** Prof. Pungor, the coordinator of this inter-Commission project, has undertaken a choice of terms to be defined and has made translations into various languages. A specimen of the document, with its several translations, is awaited and should be presented to the Bureau at Oxford. At present, the Division does not have sufficient elements to form an opinion on the mode of presentation, either as a volume or as separate articles. An examination of the document will allow the cost of publication to be determined; the Bureau and the Executive Committee of IUPAC will then be in a position to take a decision on the publication and the modalities thereof.

## 2. Commission activities

An examination of the reports presented by the Commission Chairmen shows that their work is proceeding normally and in accordance with the plans laid down at Lyngby, not only in respect of published works or works in press, but also in respect of on-going projects. Each Commission has had, or will have, a mini-meeting between June and September 1984 to review current studies.

### 2.1 Commission V.1

The most important task of the Commission was to finalize its parts of the Division Project Trace Elements in Natural Waters. All chapters, except that for manganese, have been revised by the authors, A. Hulanicki and D. T. Burns.

Two reports had been finalized and sent to the Division for approval:

*The identification and purity control of acid–base indicators* (G. Ackermann, L. Sommer, W. I. Stephen) and *The quantitative characterization of procedures using UV and VIS molecular absorption spectrophotometry* (L. Sommer, G. Ackermann).

The following reports are in progress; the new versions will be prepared for discussion at the next meeting in Poland in September 1984: *Classification of interferences* (G. Ackermann, D. Massart, A. Hulanicki) and *Metal buffers in chemical analysis* (E. Wänninen).

After a first preliminary discussion in Lyngby, the first drafts of the following reports will be discussed in Cracow: *Present status and perspectives of organic analytical reagents* (L. Sommer, S. B. Savvin, G. Ackermann) and *Characteristics of stationary phase for gas chromatography* (D. T. Burns). Proposals for new projects in the field of chemometrics are in preparation (D. Massart).

### 2.2 Commission V.2

The Commission has been very active in the field of inorganic trace analysis. Various reports have been published and others are in preparation. Commission V.2, however, considers the whole field of general trace analysis as being very important. Therefore as early as the meeting in Dortmund, FRG (September 1982) a first step was taken to incorporate organic trace analysis. This resulted, after the Lyngby General Assembly, in the formation of a subcommission in which organic trace analysis is dealt with more closely. Chairman of the group is Dr. A. Lamotte and the members are Prof. K. Bieman (Titular Member of V.2), Dr. D. Wells, Prof. K. Ballschmitter, Prof. K. Beyermann and Dr. D. Westmoreland (Associate Members).

The group met in Oudewater, Netherlands, 4–5 May 1984, and defined the work to be carried out before the General Assembly in Lyons. It was decided that the best approach would be to start with general reports which would fit best into the Commission's tradition. These reports will describe errors and pitfalls commonly encountered in the various steps of the analysis, the choice of equipment and the advantages and disadvantages in terms of capital, maintenance or labour investment. These reports will be illustrated with examples taken, preferentially, from environmental or food analysis. The next stage would be the application of the general reports to the analysis of various important organic trace components, of which the organohalogen compounds seem to be the most urgent.

The working group on surface analysis has adopted its working programme along the lines set out at the Lyngby meeting. The group will meet in Cracow (1 September) to discuss the priority areas and possible new projects. In the meantime, the preparation of reports on standards and calibration for surface analysis continues.

### 2.3 Commission V.3

**Finalized projects.** Of the six reports finalized at Lyngby, the following three have been submitted to the Division President for publication: (1/81): *Nomenclature of kinetic methods of analysis,* (5/81): *Presentation of papers for publication in luminescence spectroscopy,* and (7/81): *Presentation of results in chemical analysis.* Some new comments, concerning our 3/81 project on Nomenclature of Information Storage and Retrieval, have recently been submitted by Commission VII.1: these have to be taken into consideration at the Washington meeting — after this, this report will also be submitted for publication. The other two finalized reports (4/81 on Automated Analysis and 12/81 on Chemoptical Methods) are still being prepared for publication.

**Joint meeting with Commission VII.1.** A meeting was held on 3 May 1984 in Rio de Janeiro, where G. G. Guilbault, the V3 convener of our joint projects, met three representatives of VII.1. They discussed all the three parts of the newly-started project (15/83) on Nomenclature of Bioanalytical Methods (I. General Nomenclature, II. Classification of Analysers, III. Problems Encountered with Carryover). Drafts for Parts I and II have already been developed and discussed; revised drafts will be submitted for Washington. Part III is still in a preparatory stage. Also, the state of the V3 (3/83) project on Nomenclature of Information Theory and Retrieval has been discussed.

**Preparation for the interim meeting.** A meeting has been arranged for Sunday, 28 October 1984, in Washington DC to coincide with the Centennial celebrations of the AOAC and with the second Harmonization of Collaborative Analytical Studies Symposium. All the Titular Members, most of the American and three of the European Associate Members will be there. All the projects will be reviewed and the future activities of the Commission discussed.

### 2.4 Commission V.4

The Commission has continued to develop its work; it expects to review on-going studies during mini-meetings in the summer months. It seems likely that some projects will be completed. The Commission has also prepared a particularly important report in the framework of the Division's 'Water Project'.

### 2.5 Commission V.5

As noted in CI, the reference book *Recommended Methods of Purification of Solvents and Tests for*

*Impurities,* edited by J. F. Coetzee on behalf of Commission V.5. and published in 1982, "was so well received that it had recently gone out of stock and Pergamon Press had ordered a regular reprinting". This is the only reference book emanating from IUPAC since 1981.

The authoritative monograph *Oxidation-Reduction Potentials in Aqueous Solutions* is currently in press. IUPAC's contract with the publisher (Marcel Dekker, Inc.) calls for a hardcover edition to be available by 15 January 1985, at a price of US$29.50 worldwide. The book will be a volume of 500–600 pages prepared with the cooperation of 47 authors and 29 reviewers and edited by Allen Bard, Joseph Jordan and Roger Parsons as a joint project of Commissions I.3 and V.5.

Three reports have appeared in print in PAC and one is in press. A collection of Chinese translations of four reports is also in press.

**Projects nearing completion.** Five reports have been received by the Chairman of Commission V.5 or are in various stages of review by the Analytical Division Committee.

**Subcommittee on Electroanalytical Methods for Environmental Trace Analysis.** The following reports have been completed: *Voltammetric methods for the trace analysis of heavy metals with exotoxic significance in natural waters* (H. W. Nürnberg) and *Electroanalytical measurement of trace-metals complexation in natural aquatic conditions* (J. Buffle). These will be incorporated in the first volume of the forthcoming book series on *Trace Elements in Natural Waters* (Analytical Division Project).

A meeting has been scheduled for 23–24 October 1984, in Jülich, FRG.

## 2.6 Commission V.6

Projects are proceeding normally, and the Commission is engaged in the study of numeric data bases.

## 2.7 Commission V.7

This Commission was re-established at Lyngby; Dr. J. White was named Chairman and has submitted to the Executive Committee of the Union a list of proposed members, taking into account proposals by the Divisions of Physical Chemistry, Inorganic Chemistry and Clinical Chemistry. A short-term programme of work was drawn up, with projects that could be undertaken and then completed at Lyons.

## 2.8 Commission V.8

**Symposium on Solubility Phenomena.** Following the decision taken in 1981, the Commission is organizing this Symposium, to take place at the University of Western Ontario, London, Ontario, Canada, 21–23 August 1984. The scientific programme of the Symposium includes six plenary lectures covering different aspects of the title topic, and some 70 contributed papers are expected to be presented, in oral or poster form. According to the preliminary registration, some 130 scientists from 17 countries will attend. The Symposium is sponsored and financially supported by IUPAC, the Research Council of Canada and Atomic Energy of Canada. The Symposium Chairman is Prof. J. W. Lorimer, and the Symposium Secretary is Dr. M. Salomon. The plenary lectures will be published in PAC. Negotiations are under way for the publication of part of the contributed papers in one issue of the journal *Solution Chemistry.*

**Solubility Research and Information Project.** This is the official title of the Solubility Data Center at Emory University in Atlanta, USA, established in 1980, under the directorship of Prof. H. L. Clever. It operates presently at a modest level because of lack of funds. Repeated requests to the Division for authorization to start soliciting funds have to be examined by the Committee on Data Bases and the Bureau.

**Computerized database.** It is now over two years that an *ad hoc* Working Group of the Commission, under the chairmanship of Prof. R. P. T. Tomkins, has been engaged in the implementation of the agreement reached with Pergamon Press on a word-processing and automated database facility at the Center of Emory. The negotiation with Pergamon Press is slow, partly because of a reorganization within Pergamon's Infoline, and partly because of lack of a clear policy decision within IUPAC. Infoline has recently submitted its requirements concerning the hardware to be financed by Pergamon Press. The Working Group is presently examining the proposal, and a final decision by the Commission is expected at its forthcoming meeting.

**Commission meeting 1984.** The Commission is scheduled to meet at the University of Western Ontario, London, Canada, 17–20 August 1984. It is expected that 44 scientists, members of the Commission and its Subcommittees and contributors, will attend.

**Publications 1983/84.** A 60-page booklet *Solubility Data Series Guidelines for Compilers, Evaluators and Editors* is due to appear in June 1984. The manuscript was submitted to Pergamon in September 1983. Four hundred copies will be printed and distributed free of charge to contributors to the Series. Nine Solubility Data Series volumes have been published, or the manuscript submitted to the publisher, or are expected to be submitted during 1984.

# 3. Miscellaneous activities

**3.1.** The Division continues to participate in the work of ISO. Since the General Assembly in Lyngby, the Division's Secretary has received 12 proposals for ISO international standards and has sent them to the specialists concerned, inviting their comments.

**3.2.** The Division of Analytical Chemistry has been involved, since the first Symposium in Helsinki (1981), in the harmonization of collaborative analytical studies. A second Symposium is expected to be held in Washington, DC, in October 1984 on the occasion of the centenary of AOAC. One session will be held under the aegis of the Analytical Chemistry Division for the benefit of analytical chemists confronted with problems of method standardization and the choice and monitoring of standards. This Symposium will also help to promote the general work of the Division for international or national organization, such as ISO, AOAC and Pharmacopoea, on problems of standardization of methods, reactions and reagents, as well as nomenclature.

The organization of this Symposium was undertaken by Dr. Harold Egan who died suddenly at the end of June 1984. Harold Egan was former Chairman of the Applied Chemistry Division; he was an analytical chemist with an international reputation. The Analytical Chemistry Division wishes to acknowledge his achievements and his devotion to the Division.

## 4. Development activities

Without going, in this report, into the details of all future short- or medium-term projects of the Division and its Commissions, the role that the Analytical Chemistry Division is called on to play in the Numeric Data Bases Committee should be mentioned. At present, Commissions V.6 and V.8 are directly concerned with this subject and have made a major contribution. Nevertheless, even with respect only to analytical chemistry, numeric data bases, as well as the problems of information management and computerization, present an aspect of interest to each of the Division's Commissions. For example, the problems of 'chemometry' and the standardization of analytical reagents are of concern to Commission V.1. Commission V.3. can contribute to the work on the Nomenclature of Analytical Chemistry, since it appears that certain terms should be rigorously defined. Also, the computerization and recording of spectral or electrochemical microanalytical data merit the attention of the Commissions concerned.

Since the 32nd General Assembly in Lyngby, the Analytical Chemistry Division has steadily carried out the programme of work that it set itself, not only in on-going projects but also in new ones. This work is reflected in the publication of articles in PAC and in the active participation of its members in numerous conferences and colloquia.

The Division ensures continuous and effective progress with the specificity corresponding to each of its Commissions, thus sharpening the service it is called on to render in all fields of chemical activity.

**F. Pellerin**

## Annex: List of articles published in PAC

Definition of pH-scales, standard reference values, measurement of pH and related terminology. A. K. Covington, R. G. Bates and R. A. Durst, PAC, Vol. 55, pp. 1467–1476 (1983) — Commission V.5.

Critical survey of stability constants of complexes of indium. D. G. Tuch, PAC, Vol. 55, pp. 1477–1528 (1983) — Commission V.6.

Nomenclature, symbols and units recommended for *in situ* microanalysis. N. Grasserbauer, K. F. J. Heinrich and G. H. Morrison, PAC, Vol. 55, pp. 2023–2027 — Commission V.2.

Application of ion selective electrodes in non-aqueous and mixed solvents. E. Pungor, K. Toth, P. G. Klatsmanyi and K. Izutsu, PAC, Vol. 55, pp. 2029–2065 — Commission V.5.

Nomenclature, symbols, units and their usage in spectrochemical analysis. VI. — Molecular luminescence spectroscopy. W. H. Melhuish, PAC, Vol. 56, pp. 231–245 (1984) — Commission V.4.

Critical survey of formation constants of complexes of histidine, phenylalanine, tyrosine, L-DOPA and tryptophan. L. D. Pettit, PAC, Vol. 56, pp. 247–292 (1984) — Commission V.6.

Radiochemical problems of fusion reactions. I. — Facilities. M. B. A. Crespi, PAC, Vol. 56, pp. 293–299 (1984) — Commission V.7 ('ancien régime').

Spectrophotometric and fluorimetric determination of amines. J. Bartos and M. Pesez, PAC, Vol. 56, pp. 467–477 — Commission V.1.

Formation of metal complexes with ethylenediamine: A critical survey of equilibrium constants, enthalpy and entropy values. P. Paoletti, PAC, Vol. 56, pp. 491–522 (1984) — Commission V.6.

Selected data on ion exchange separations in radioanalytical chemistry. N. Saito, PAC, Vol. 56, pp. 523–539 (1984) — Commission V.7 ('ancien régime').

Evaluation of solubility of electrolytes from conductivity measurements. R. Fernandez-Print and J. C. Justice, PAC, Vol. 56, pp. 541–547 (1984) — Commission V.8.

Diffusion coefficients of metals in mercury. Z. Galus, PAC, Vol. 56, pp. 635–644 (1984) — Commission V.5.

---

# VII. CLINICAL CHEMISTRY DIVISION

VII.1. Commission on Automation and Clinical Chemical Techniques.
VII.2. Commission on Quantities and Units.
VII.3. Commission on Teaching.
VII.4. Commission on Toxicology.

## Introduction

In conformity with Bylaw 4.109, the President of the IUPAC Clinical Chemistry Division has prepared this written summary of activities and accomplishments of the Division during the ten months since the 32nd General Assembly in Lyngby.

## Commission activities

### Commission VII.1

The Commission has submitted the following revised statement of its terms of reference:

"1. To define terms related to automated and non-automated analytical procedures in clinical chemistry, based on existing terminology of IUPAC and other international organizations, with particular emphasis on resolving any differences and inadequacies in current terminology.
2. To provide IUPAC with information about the on-going developments in clinical chemical analysis as a branch of applied chemistry."

The Commission met in Rio de Janeiro on 4 May 1984, during the International Congress of Clinical Chemistry. The Commission reviewed (a) Dr. Bonini's progress in preparing a document on electronic data processing and microprocessors, (b) Dr. Burtis's draft document on general aspects of bioanalytical nomenclature, and (c) Dr. Haeckel's draft document on classification of analyzers. The latter two documents are being written in cooperation with Commission V.3. Further drafts of these documents will be reviewed at the Commission's next meeting, to be held in Barcelona, Spain, on 12 October 1984, during the International Congress on Automation and New Technology in the Clinical Chemistry Laboratory.

### Commission VII.2

The Commission has submitted the following revised statement of its terms of reference:

"To ensure that the quantities and units used by clinical chemists (and other health care professionals) are consistent with current standards promulgated by authoritative international standards organizations in metrology, and are in a form that will improve, based on fundamental scientific principles, the delivery of health care through the clinical laboratory."

Documents drafted by Drs. Hermann and Onkelinx on *Quantities and units in clinical chemistry: Nebulizer and flame properties in flame emission and absorption spectrometry* and by Dr. Siggard-Andersen *et al.* on *Physicochemical quantities and units in clinical chemistry with special emphasis on activities and activity coefficients* are now in press in PAC. A draft document by Mr. Rigg *et al.* on *Nomenclature of derived units* is awaiting approval by IDCNS, and several other draft documents are in various stages of preparation. The Commission met in London, UK, on 19–21 March 1984, and it plans to meet in Strasbourg, France, on 10–12 October 1984.

### Commission VII.3

The Commission has submitted the following revised statement of its terms of reference:

"1. To gather information on the state of education in clinical chemistry in the world and to disseminate this information.
2. To make recommendations on the content and standards of educational programmes internationally.
3. To stimulate, sponsor, or undertake educational programmes especially in developing countries.
4. To stimulate and assist the organization of educational activities such as workshops, courses, symposia, and congresses in clinical chemistry.
5. To make recommendations on the content and standards of educational programmes worldwide, and to disseminate this information.
6. To collaborate with IUPAC Committee on Teaching of Chemistry. Both bodies should nominate one of their members to act as a liaison officer.
7. To collaborate with other national and international bodies whose aims are helpful in the development of clinical chemistry education.
8. To develop methods for evaluation of educational programmes and graduates of such programmes.
9. To develop the accreditation of educational programmes and certification and licensure of practitioners of clinical chemistry."

The Commission met in Rio de Janeiro, Brazil, on 30 April 1984 during the International Congress of Clinical Chemistry; the Commission approved for publication in PAC a document by Dr. Worth entitled *A basic education and training framework for medical laboratory techniques in clinical chemistry* and a document by Drs. Worth, Siest, and colleagues entitled *Drug effects in clinical chemistry: Educational aspects.* A draft document by Drs. Fraser and Zinder on *Teaching of clinical chemistry in the medical curriculum* was considered, as well as a draft document by Dr. Fraser entitled *Teaching guidelines for clinical chemists for effective communication.* The Commission plans to meet in Barcelona, Spain, on 15 October 1984, during the International Congress on Automation and New Technology in the Clinical Chemistry Laboratory.

### Commission VII.4

The Commission submitted the following revised statement of its terms of reference:

"1. To develop and evaluate methods for detection and quantitation of toxic agents and/or their metabolites in human body fluids, tissues and excreta.
2. To assess biological effects of toxic agents by determination of alterations in the body tissue and cell constituents and metabolism.
3. To prepare and/or recommend reference materials and quality control procedures to promote accuracy and precision of toxicological tests.
4. To recommend and promote international agreement concerning reference values for the interpretation of toxicological tests, as well as for critical values which are based upon analyses of human body fluids, tissues, and excreta, and which are used as indices of exposure and absorption of toxic substances.
5. To exchange information in the areas of analytical and chemical toxicology with scientists and professional organizations."

The Commission approved for publication in PAC a document by Drs. Aitio and Jarvisalo entitled *Collection, processing, and storage of specimens for biological monitoring of occupational exposure to toxic chemicals.* The proceedings of the Second International Conference on Clinical

Chemistry and Chemical Toxicology of Metals (Montreal, July 1984) were edited by Drs. Brown and Savory, and promptly published by Academic Press, as a 400-page volume with 64 papers. The Commission made provisional arrangements to organize the Third International Congress on Chemical Toxicology and Clinical Chemistry of Metals in Japan during July 1986. The Commission plans to meet in Paris on 7 September 1984, during the International Conference on Nickel Metabolism and Toxicology.

**The Nickel Subcommittee** organized the Third International Conference on Nickel Metabolism and Toxicology to be held in Paris, France, 4–7 September 1984. As of mid-July 1984, there are more than 100 registrants and 58 scientific papers for the conference.

**The Cadmium Subcommittee** approved for publication in PAC Dr. Herber's document on *Beta–2 microglobulin in urine and other proteins as an index of cadmium nephrotoxicity*. Dr. Stoeppler has coordinated efforts to develop field methods for analysis of cadmium in blood and urine by Zeeman atomic absorption spectrometry and by anodic-stripping-voltametry.

**The Subcommittee on Aluminium** met in Newport, California, on 19 June 1984, during the International Conference on Aluminium-related Disease. The Subcommittee reviewed the outcome of an interlaboratory survey on aluminium analysis in body fluids. Drs. Stevens, Day, and Savory are drafting a document on *Analytical biochemistry of aluminium*, with a target completion date of September 1984. An International Conference on Recent Advances on Aluminium Toxicity will be held in Manchester, England, during mid-summer 1985.

**The Subcommittee on Selenium** met in Beijing, China, on 28 May 1984 during the International Symposium on Selenium in Biology and Medicine. The final draft of a document on the first interlaboratory survey of selenium analysis in body fluids is being reviewed by the Subcommittee prior to publication in PAC. The second interlaboratory survey of selenium analysis in human serum and urine is presently underway.

**The Subcommittee on Chromium** is presently being organized under the chairmanship of Prof. Shapcott of Sherbrooke, Quebec, Canada.

## Division Committee

Division Committee will meet in Paris, France, on 8 September 1984, following the International Conference on Nickel Metabolism and Toxicology. During the past year, the Division Committee has coordinated the work of its Commissions and has maintained its extradivisional activities and representation to JCBN, IDCNS, CI, the Working Party on Medicinal Chemistry, the World Health Organization, the Programme Committee of the 30th IUPAC Congress (Manchester 1985), and other international scientific organizations (IFCC, IUTOX, ICSH, COWS/WASP, and IUPHAR).

**F. William Sunderman, Jr.**

# IUPAC – SPONSORED CONFERENCES

## 2nd International Congress on Automation and New Technology in the Clinical Laboratory, Barcelona, Spain, 15–18 October 1984

The scientific sessions of the Congress will be held in the Palacio de Congresos, Avenida María Cristina in Barcelona. After the opening lecture — How the past has set the scene for the present (J. Whitehead, USA) — the programme comprises three plenary (45 min) lectures, two 30-min lectures, twelve symposia (some in parallel) and two 60-min poster sessions.

The *plenary lectures* are —

Impact of new technology on the future of clinical chemistry (V. Marks, UK)
New developments in microbiology (R. H. Yolken, USA)
New developments in haematology (S. M. Lewis, UK)

whilst the two *lectures* will be —

Nomenclature for automated analysis (M. Hjelm, UK)
European Committee for Clinical Laboratory Standards (I. Batty, UK).

The symposia topics are — Quantitative cytometry; Cellular chemistry; Mass spectrometry and nuclear magnetic resonance; Impact of microcomputers; Equipment for the small laboratory; Evaluation procedures; New quantitative techniques for the diagnosis and identification of microbial antigens in biological specimens; Quality control of haematology analyzers; Emerging technology; Coagulation and agglutination; Application of monoclonal antibodies for the clinical laboratory; Techniques affecting the future of clinical laboratories.

Simultaneous translation will be available during plenary lectures and symposia, allowing presentation of papers in English, Spanish or French. These languages will also be permitted for poster presentations which must, however, have an adequate summary in English. The registration fee after 30 June 1984 is Ptas. 23,000.

Barcelona, capital of the province of Barcelona since 1833, and before that capital of Catalonia, is built facing the Mediterranean sea between the rivers Besós and Llobregat. The site has been occupied since the third millennium BC and the Romans founded a colony there in about 7 BC. Some traces of the Roman city still remain. The city was occupied by the Moors in 716 but recaptured by the Franks in 810. By the end of the 9th century the independent countship of Barcelona was recognized as superior to its neighbours. During the 10th and 11th centuries the city prospered and expanded and a new cathedral was built. In the 12th century the union of Catalonia and Aragon took place, trade expanded and the wealthy merchant class started to be elected on to the municipal council. In the 13th century a new city wall was built to include the outlying villages but the ever-increasing population required yet another wall, the third, to be built in the 14th century. In spite of a series of outbreaks of bubonic plague, the city continued to prosper until the 17th century when a recession in trade brought about serious social instability, followed by wars — the last being that between England and France (Napoleonic War). Political unrest continued, although trade recovered, and Barcelona became the centre of the Catalan separatist movement and of Spanish trade unionism. During the Spanish Civil War, Barcelona took the Republican side, and suffered some damage from bombing, but fell in January 1939. Today, it is a thriving city and seaport with a wealth of history behind it.

# Commission V.6 — Equilibrium Data: Activities and *Raison d'Être*

Commission V.6 is the second oldest Commission in the Analytical Chemistry Division, having been established in 1955. The main reason for establishing the Commission was for compilation and publication of books and reports containing all data concerning equilibrium constants of chemical reactions, including oxidation–reduction reactions. The task of the Commission has now been expanded. We have completed several other projects in the past 30 years and are embracing new projects, although compilation of equilibrium data is still the Commission's most important work. Activities of Commission V.6 are summarized as follows:

Prof. H. Ohtaki, Chairman, Commission V.6

**Compilation of Stability Constants of Metal–Ion Complexes**

The first compilation in this series was completed by Profs. L. G. Sillén, J. Bjerrum and G. Schwarzenbach and the first edition of *Stability Constants of Metal–Ion Complexes, with Solubility Products of Inorganic Substances* appeared as Part I, for complexes with organic ligands, in 1957 and Part II, for those with inorganic ligands, in 1958. The volumes were bound into one book and published as the second edition in 1964, with Profs. Sillén and A. E. Martell having editorial responsibility. The first supplement of the book was published in 1971. Since Prof. Sillén died just before publication, Dr. E. Högfeldt completed this work in cooperation with Prof. Martell. Stability constants appearing in journals after the publication of the first supplement were collected by Dr. Högfeldt and Prof. D. D. Perrin and compiled as Part A, for inorganic ligands, in 1983 and Part B, for organic ligands, in 1979.

Ionization constants of acids and bases were separately published first by Profs. G. Kortum, W. Vogel and K. Andrusson in 1961, were revised and expanded by Profs. E. P. Serjeant and B. Dempsy and published in 1979 as a book *Ionisation Constants of Organic Acids in Aqueous Solution*. Ionization constants of organic bases were compiled by Prof. Perrin and disseminated under the title *Dissociation Constants of Organic Bases in Aqueous Solution* in 1972. These books were further revised following painstaking work by these distinguished Australian scientists and published in 1979 for organic acids and bases, and in 1982 for inorganic ones.

This compilation work was recognized as being of great value, and hence Subcommittees on Stability Constant Data and on Solubility Data were established (the latter became Commission V.8 in 1979) for collection and compilation of these data. Since a tremendous number of stability data are being published every year in all parts of the world, collection and publication of up-to-date data cannot be done efficiently by the usual procedures for producing books. Commission V.6 therefore decided to introduce computer storage and sorting for the compilation work. Preliminary investigation has been carried out and members of the Subcommittee on Stability Constant Data (Chairman: Dr. L. D. Pettit), and volunteers who cooperate with them, are collecting data from various journals all over the world.

**Critical Surveys of Equilibrium Constants**

The data compilations *Stability Constants of Metal–Ion Complexes* have been widely used by almost all chemists in the world interested in chemical reactions in solution. However, since the books contained all the data published in various journals, large discrepancies were sometimes found among values determined for complex-formation reaction by different researchers, and therefore users of the books have the problem of judging which value is reliable and which others contain larger uncertainties. In order to help users' selection, Commission V.6 is critically reviewing equilibrium data. The reviews are being published as a series of *Critical Surveys of Equilibrium Constants of Complex Formation Reactions and Extraction Constants at Liquid–Liquid Distributions*. The project is still continuing and covers a wide variety of complex equilibria in solution.

**Other Projects**

Commission V.6 has various projects besides the major ones described above. We have prepared guidelines for the determination of stability constants which offer some standard methods for equilibrium measurements. Reviews of thermodynamic functions for transfer of ions from water to another solvent gave useful information to chemists who participate in nonaqueous solution chemistry. Two new projects were approved at the last Commission meeting in Lyngby, Denmark. These were (i) The Rationalization of Ion Exchange Data (E. Högfeldt) and (ii) Metal Complex Equilibria with Organic Polyelectrolytes (P. Valenta).

**Joint Projects with Other Commissions**

Since equilibrium data in solution provide the most fundamental knowledge of chemical reactions in solution, Commission V.6 often cooperates with other Commissions, e.g. Commissions V.5 and V.8, and sometimes contributes to Intercommission Projects of the Analytical Chemistry Division. In this respect the contribution of Commission V.6 to the project Determination of Trace Elements in Natural Waters (project leader: Prof. H. W. Nürnberg) should be noted. We have also cooperated with Commission V.5 for compiling acid–base dissociation constants in dipolar aprotic solvents (project leader: Prof. K. Izutsu) and members of Commission V.6 occasionally work with those of Commission V.8 on solubility data projects. Therefore, at every IUPAC General Assembly Commission V.6 has had joint meetings with Commissions V.5 and V.8 to discuss problems of mutual interest.

**Members**

The current members of the Commission are listed in CI, 1984, No. 1, p. 37 and in CI, 1984, *Supplement* (*IUPAC Handbook*).

**Forthcoming Meetings**

Commission members meet every even-number year at some international conference. The next meeting of Commission V.6 will be during the 23rd International Conference on Coordination Chemistry, to be held in July/August 1984, in Colorado, USA. This will be an informal meeting since many members of the Commission will not be there. At the 33rd IUPAC General Assembly in Lyon, France, in 1985 the Commission will have its usual biennial plenary meeting.

**H. Ohtaki**

# The role of the chemical industry in development

by Prof. K. H. Büchel
Chairman, COCI

## CHEMISTRY AND WORLD NEEDS

Chemistry has always been a very practical science. Like no other scientific discipline, chemistry has created an industry. The very first products of the young chemical industry in the 19th century fulfilled human needs, e.g. dyestuffs, pharmaceuticals, agrochemicals. Thousands of products have been created since, synthetic fibres, plastics — virtually the indispensable material basis of modern life in the industrialized countries. For them, the chemical industry was very instrumental in their socio-economic development.

What kind of development are the Third World countries looking for? I think the answer is very clear if one recalls some of the grim statistics that Prof. Crabbé and Prof. Borlaug recently presented:

In 1982, 3.4 billion people — out of a total of 4.5 billion — lived in developing countries;
More than 1 billion people are undernourished or starving;
About 1 billion people are suffering from tropical diseases;

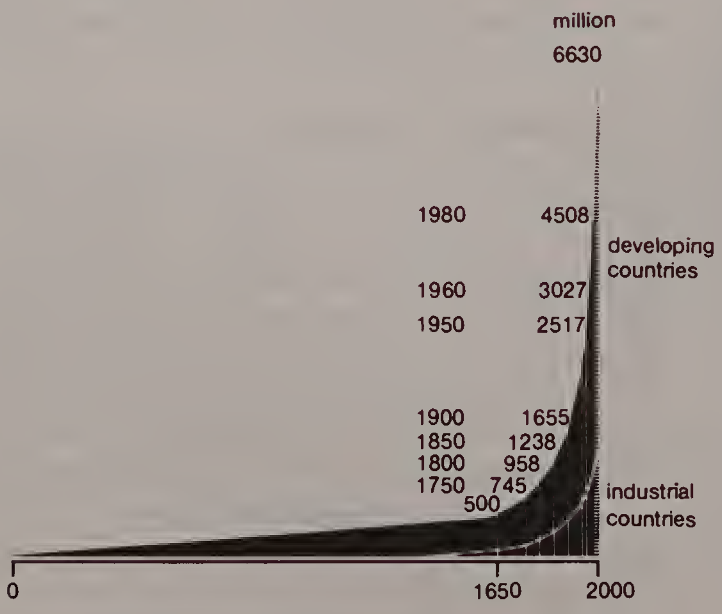


**Fig. 1. Increase of world population**

**Prof. K. H. Büchel, Chairman, COCI**

The *per capita* gross national product is much less than one tenth of that of the people in the industrialized countries;
Unemployment ranges between 20 and 50% of the working class in developing countries;
At the present rate, the world population will double in about 40 years. In the 'magical' year 2000 there will be 2 billion people more than today. Most of the population growth is in Third World countries.

Obviously, the most urgent issues are *food* and *health*; they are the basis for further economic and social development. Therefore I should like to talk first about the contributions the chemical industry makes to relieving these problems.

This article is based on a lecture given by Prof. Büchel at an IOCD Conference in Mexico, March 1984, and we are grateful to the Consejo de Salubridad General for permission to publish the text.

## WORLD FOOD SITUATION AND AGRICULTURE

### *Food supply*

What is the world food situation today and what can be done about it?

Figure 2 shows one of the most alarming developments that have occurred since the beginning of the energy crisis. For several years, the world production of cereals has been unable to keep up with consumption; as a result, carry-over stocks are dwindling year by year. According to official statements of the US Department of Agriculture, the grain stocks of the world have dropped in 1981/82 to their lowest level since the Second World War. We have to realize that during the last five years the world's total output of cereals has exceeded consumption by a margin sufficient for only four days. During the last two years, indeed there has been a deficit of about 70 million tonnes. The stocks are running down.

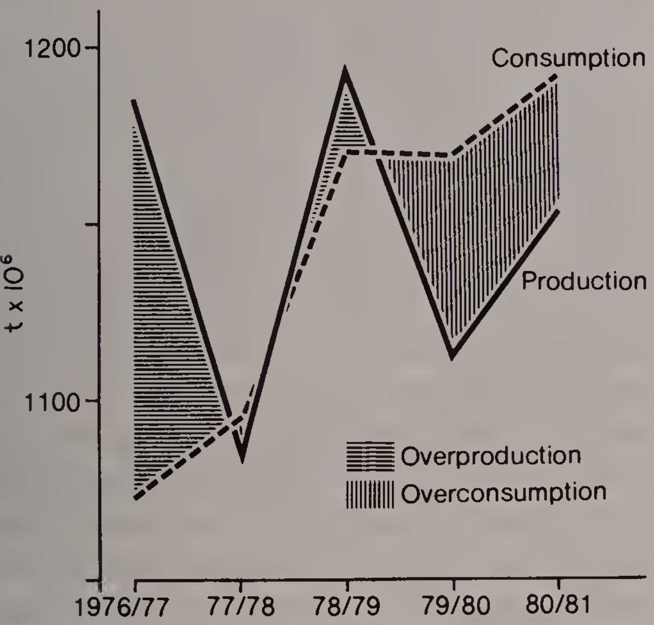


**Fig. 2. Production and consumption of cereals (except rice) (t × $10^6$), world**

Even after the good grain harvests of 1982 and 1983, the surpluses in the USA and Europe — which cause such political upheaval — are insignificantly small when compared to the real world needs. The present situation shows that we need a restructuring of the world markets for agricultural commodities. The bleak fact remains that hundreds of millions of people face famine and starvation.

In the face of this situation it seems almost unbelievable that more than an estimated third of the world's total potential harvest is still being lost to insects, plant diseases and weed competition. Figure 3 shows some calculations by the FAO, as published in 1978, for five of the world's most important crops.

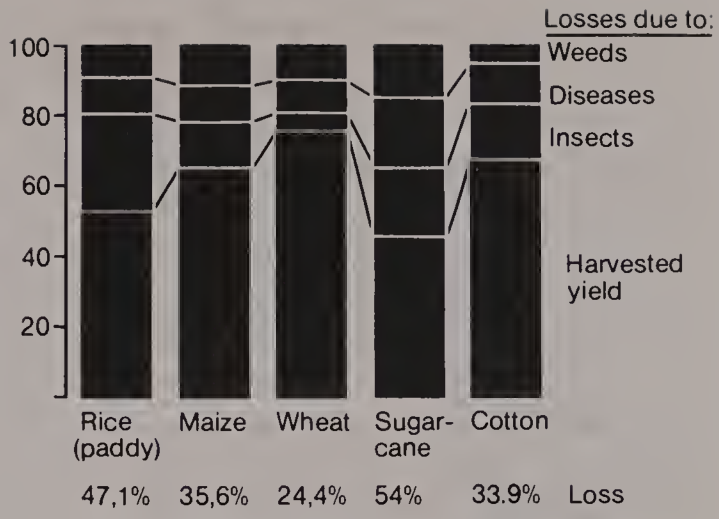


**Fig. 3. Crop losses before harvest/world production — potential yield = 100 (FAO, 1978)**

For example, the total loss in rice growing is equivalent to the total rice production of Asia, excluding Japan and Thailand, in 1980. For wheat the loss is equivalent to the total production of Asia and Australia. Most of these losses could be prevented by application of present-day know-how and available pesticides. I would like to draw your attention to a resolution, passed at a meeting of several UN organizations and the World Bank in late 1981, which stated the following: "If it were possible to reduce crop losses by only 15%, this would result in an additional production of 100 million metric tonnes of cereals. This would be equivalent to the food supply of nearly the same number of people." Expressed in cereal prices, the equivalent is about 16 billion US dollars, which is exactly the amount of money spent annually by the industrialized nations on aid to developing countries.

### *Non-edible crops*

These considerations are not, of course, restricted to edible crops. Many other agriculturally grown raw materials, such as natural fibres (e.g. cotton, hemp, sisal) and natural rubber, constitute the backbone of the national economies of many developing countries and represent a high export value. Cotton, without chemical protection, would today be an article of exclusive luxury. The extent to which the cotton harvest is safeguarded by crop protection measures is demonstrated in Fig. 4. It shows how improved control methods in a Central American country changed the situation of the whole cotton industry within only a few years, giving the crop a key position in the national economy.

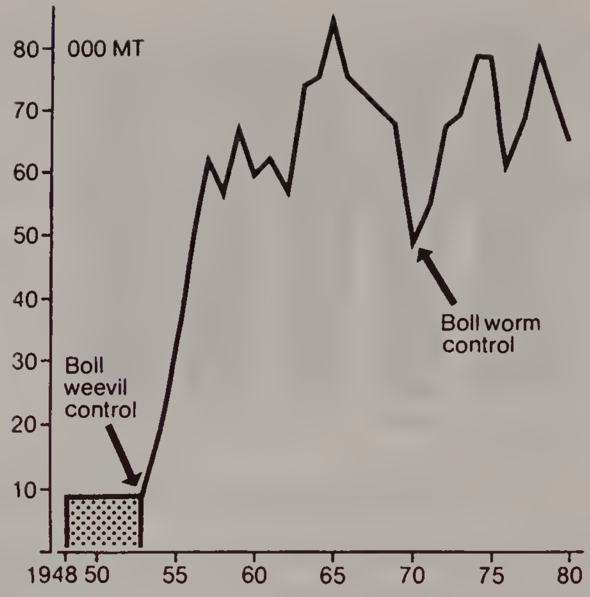


**Fig. 4. Production of cotton (lint) in El Salvador, 1948–1980**

### *Agriculture and food policies*

This leads directly to the question of the impact which pesticides have or could have on the economies of the countries of the Third World. We have to take into account that there are really two different problems. The first is the problem of producing sufficient food for increasing populations; the second is the need to make agricultural production an efficient part of the general economy of these countries. In terms of the direct food supply one has to make a distinction between the three types of crop grown in developing countries —

**Subsistence crops:** Wide range of local crops for home use, e.g. cassava, millet, beans.

**Stable food crops:** Large volume crops for wide-range use, e.g. wheat, corn, rice, potatoes.

**Cash crops:** Special crops grown for export purposes, e.g. coffee, tea, cocoa.

In my view, there is no doubt about the key function of subsistence crops — be they cassava (manioc) in some countries or several cultivars of millet in others or the wide range of local crops in several parts of the southern hemisphere. These plants are grown under conditions which lead to yields far below their genetic potential. To improve the food supply under the local conditions of different countries, by improving the yield and nutritional value of these crops, is undoubtedly one of the most urgent tasks for plant breeders and agricultural experts. The PRONAL Programme (Programa Nacional Alimentario) in Mexico is a good example for this approach. Crop protection products will be needed to assist such programmes. As regards staple foods, like cereals or potatoes, rationalization in the more developed countries has already reached levels that can hardly be achieved within a short time by the developing countries. It must be realized that, for the next few decades, it will be easier to produce staple food crops more efficiently in the developed countries. There is no doubt that herbicides and fungicides have contributed considerably to this situation and will continue to do so.

As far as cash crops are concerned, the situation is different. The balance of payments contributes to the economic situation of the whole country, and the whole nation finally profits from a positive export balance. The chemical industry can help to maintain historic rural structures, where they still exist. An illustration is provided by cocoa growing in Ghana, which is run mainly by independent farmers. Cocoa production in Ghana would have collapsed without chemical crop protection.

Here the question arises of general policy in respect to the countries of the Third World. The problem of the Third World can shortly be described as a fivefold shortage: the shortage of food, energy supply, employment, education and purchasing power. The shortage of food is of special importance. Independence in terms of food supply is one of the most important goals, it means security! This situation, of course, leads one to some aspects of the philosophy of development aid. The development of effective agriculture — based on modern technology — should be given the first priority. Here agricultural chemicals, like pesticides and fertilizers, are essential tools for this achievement. It is sometimes stated that many people in the Third World would be happier without modern technologies like chemistry. If, however, most developing countries continue to aim to achieve Western standards, they impose on themselves the same economic rules as are valid for the industrialized nations. If these economic terms are accepted, the consequences will inevitably lead to further technological development, and to better use of chemistry.

## CHEMISTRY AND FOOD

If one looks at the role of chemistry in the development of agriculture, one sees that it can be classified under four headings — Mineral fertilizers; Pesticides; Protein supply; and Protection of the harvest — which will now be discussed in detail.

### *Mineral fertilizers*

It is possible, with the aid of chemistry, for a world population even larger than that of today to be fed adequately. Without products of chemical industry, however, nourishment of mankind would collapse.

The use of mineral fertilizers is a *sine qua non* for adequate agricultural production. Consider the following points:

Today, all agricultural regions would be in poor shape if it had not been possible — in consequence of the discoveries of Justus von Liebig — to restore, retain and improve the fertility of the soil.

The world's present food supply can be maintained only by high cereal production, especially in North America, Europe and Argentina. An agricultural output of the required magnitude would be impossible without mineral fertilizers.

Adequate agricultural production in the developing countries can be expected only if plant nutrients are supplied to the land in sufficient quantities. In particular, there is no prospect of the 'Green Revolution' being a permanent success unless mineral fertilizers, supplemented by pesticides, meet the increased demands on the soil of the high yielding new crop varieties.

A wide range of high quality mineral fertilizers is now available. They include fertilizers that have been developed to meet the needs of particular soils and particular plants.

Slow-release fertilizers and particular combinations of trace elements often applied as foliar fertilizers offer additional opportunities.

### *Pesticides*

If the world's total food production is to be maintained and increased, the use of chemical pesticides is indispensable.

Agriculture is food production for man and therefore means taking a deliberate decision to favour particular plants over others. Crop growing in essence means monocultures and it is therefore necessary to provide for the protection of the desired plant species against detrimental organisms.

No effective alternatives to chemical plant protection have yet been found. We expect that modern plant breeding and genetic engineering methods will support the conventional efforts. New varieties of plants will require intensive care by adapted chemical plant protection.

About one third of the world's agricultural production is lost to pests before the harvest. This means that our hard-working farmers are working every third day without return. Considerable food production reserves could be mobilized through adequate extension of chemical plant protection.

The loss quota would rise to at least two thirds of the potential harvest if no chemical pesticides were used. Food price increases and disastrous famines would be inevitable.

Acute dangers to individual crops, in the form of epidemic attacks of locusts, rice bugs or cereal rust diseases for example, cannot be averted by biological products, they can be fought only by the immediate use of fast-acting chemicals.

Without chemical plant protection crop losses caused by pests and plant diseases would make the agricultural production of, for example, cotton, rice, fruits and vegetables uneconomic if not impossible.

In modern agriculture chemicals serve as tools in order to save labour and facilitate harvesting. For instance, cereals, sugar beet or soy beans cannot be grown economically in the absence of herbicides.

Both the quality and market value of many crops, e.g. fruits and vegetables, would be considerably impaired without the aid of pesticides.

Pesticides (insecticides), fungicides and herbicides, have been most thoroughly investigated in respect to toxicology, residue properties and metabolic and environmental behaviour. They have to stand up to continuous reappraisal by scientists and public authorities. New and better products are continuously evolving.

### *Protein supply*

Only with the aid of chemistry will it be possible to ensure the world's protein supply in the long term.

About 60 to 70% of the world's crops are used as animal feedstuffs since only *plants* are able to synthesize all the required amino acids, carbohydrates and fats economically.

Animal feed additives, like antibiotics, vitamins, synthetic essential amino acids, minerals and trace elements, are effective aids in the production of animal protein.

Successful livestock farming depends on the use of chemical products in veterinary medicine.

### *Protection of the harvest*

Foods and animal feedstuffs cannot be effectively stored, distributed, preserved or processed — thus passing through all stages between harvesting and consumption — without the aid of chemical products.

Destructive organisms like bacteria, fungi, insects, spider mites and rodents cause additional damage to agricultural products during transport, storage and processing. The resulting losses are of the same order of magnitude as those which occur prior to harvesting.

Suitable preservation protects foods from decay and prevents the formation of highly toxic metabolites of microorganisms like mycotoxins or botulin.

In addition,

Chemical technology used in the manufacture of food will undergo further development — especially if one considers all the options of biotechnology — resulting in improvements in quality and quantity, as may be concluded from the history of margarine, sugar and starch.

The development of new pesticides is being directed towards even more selective compounds which do not harm the ecosystem as a whole and are rapidly broken down.

Important work is also being done in the field of compounds which regulate growth and development of plants and animals.

I believe, therefore, that one can conclude that chemical research will play a more and more important part in man's efforts to ensure that there is adequate food for everyone.

## CHEMISTRY AND HEALTH

It is sometimes overlooked that the public health sector also profits from plant protection. More than 10% of the world's population is grossly undernourished and more than one person in four suffers from malnutrition. Diseases in the developing countries are often promoted by malnutrition. So it is obvious that an improvement of food supply is the most important requirement for human welfare.

### *Control of vector-borne diseases*

There is another closely connected aspect of public health, namely the control of vector-borne diseases. The majority of them still prevails in the tropical and subtropical areas, and the hope for a total eradication has dwindled during the last few years. A WHO list of the main diseases shows, for the current period, the infectious diseases and numbers of people affected, illustrated in Fig. 5. If only these parasitic, vector-transmitted diseases are considered, it is clear that more than one third of the existing world population is threatened or affected by these epidemics. Experience tells us that there is only one strategy for real success in the control of these diseases:

1. Systematic control of the transmitting vectors
2. Ecological sanitation of breeding places
3. Systematic medical treatment of the endangered population
4. Effective and strict organization of the campaigns

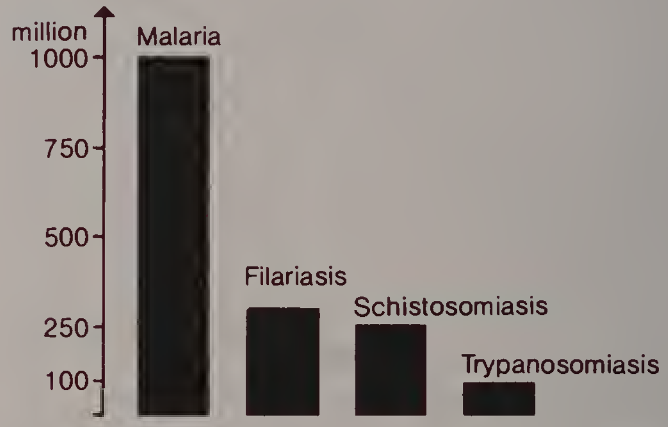


**Fig. 5. Number of people threatened or infected by the four main vector-borne tropical diseases. Total, more than 1–6 billion.**

If these lines are followed, the deadly host–parasite cycle can be broken, provided the programmes are continued until eradication is really — and not only seemingly — achieved. If a programme should finally fail, at least one of the four prerequisites must have been lacking or it did not exist for long enough; generally, the organization of the campaign was a failure. Resistance never has been the reason for breakdown of eradication programmes, in spite of what we are repeatedly told by the newspapers.

### *Contributions of chemistry to health*

It should not be forgotten that, in addition to the humanitarian aspects of disease control, there is a vital socio-economic aspect: in countries which are struggling very hard to improve their social conditions, and standards of life, it is a heavy burden to be confronted with a high percentage of disabled persons whose labour is lacking to the community.

In general terms, the role of chemistry for the improvement of human health can be described thus:

> In the absence of chemical products and processes today's high standards of public health and medical care would be inconceivable.

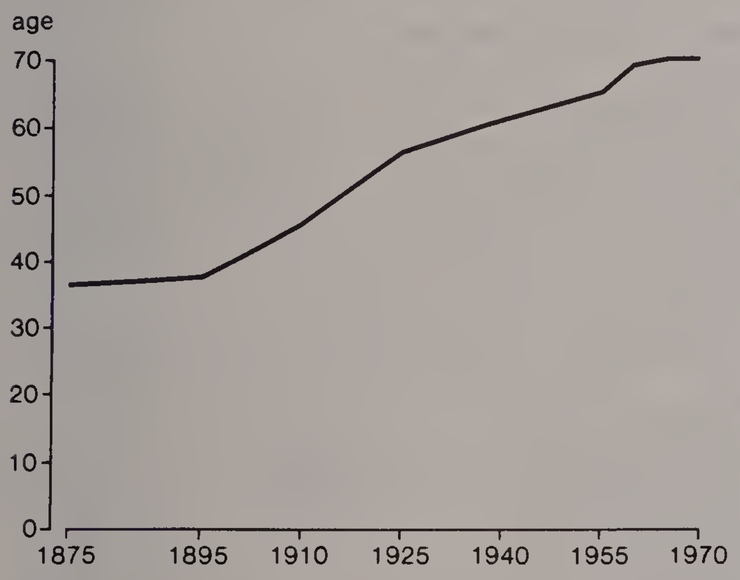


**Fig. 6. Life expectancy. Increase from 1875 to 1970**

In the last hundred years, for example, human life expectancy in the industrialized countries has more than doubled. Chemical research has made important contributions to the present knowledge of the physiological processes of humans and animals. This knowledge has formed the basis of significant successes in the prevention, diagnosis and treatment of deficiency states, infectious diseases, hereditary and acquired defects, injuries, etc. For example, the decrease of mortality due to infectious diseases over the last 100 years — owing to significant breakthroughs in pharmaceutical research — has been dramatic. Today —

Bacterial and fungal infections can be controlled very effectively with sulphonamides, antibiotics and antimycotics;

Hormones, vitamins, and trace elements are available for the treatment of practically all known deficiency diseases and symptoms;

Diagnostics, most of them very simple to use, are assisting in the diagnosis of diseases of all kinds;

Modern surgery would be inconceivable without the highly effective narcotics, anaesthetics and disinfectants of today, which are essentially free from side-effects;

The synthesis of special polymers by the chemical industry is the basis for the development of modern artificial limbs and organs, medical instruments and medical aids;

Inoculation programs have brought many infectious diseases, epidemic and sporadic, under control, and in some cases even eliminated them entirely;

The treatment of mental diseases of all types has been improved and simplifed by the introduction of antipsycotics, antidepressants and tranquilizers.

The international pharmaceutical industry — with the full weight of billions of R&D dollars — is now concentrating on cancer, heart and circulatory diseases, chronic bacterial, fungal and parasital infections, viral infections, certain neurological and metabolic diseases, and inflammatory diseases, diseases which cannot yet be controlled effectively — if at all — and are among the most frequent causes of death.

The study of tropical diseases at industrial laboratories has a long and honorable tradition.

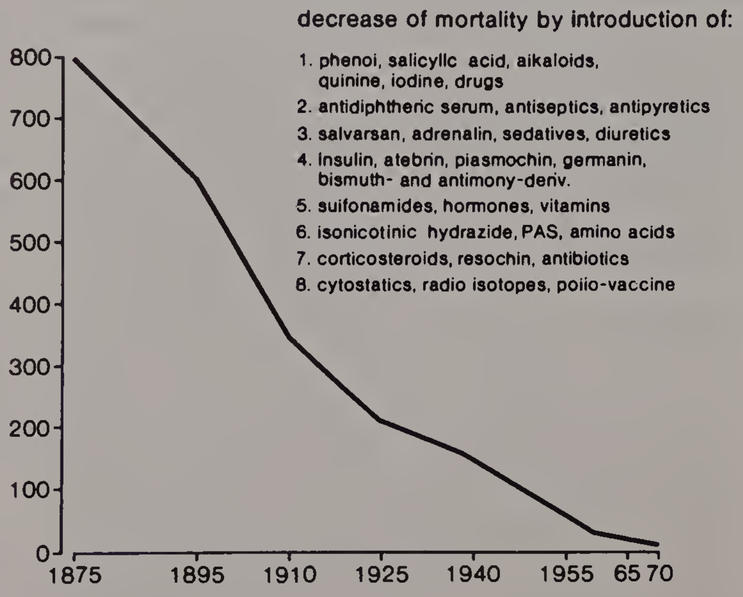


**Fig. 7. Mortality due to infectious diseases (deaths/ 100 000 inhabitants)**

Since its early days the pharmaceutical industry has been concerned with the public health of what are now the developing countries. I would like to draw your attention to the successful development of drugs against malaria, sleeping sickness, amoebiasis and helminthic diseases, to name but a few of them. The study of tropical diseases played an important part in the history of our company for example. The development of drugs such as Germanin against sleeping sickness, Plasmochin, Atebrin, and Resochin against malaria, and Biltricide against schistomiasis illustrate the success of these activities.

Contrary to a widespread belief, there is no life-threatening tropical disease nowadays for which no drug has been developed that will cure at least a very high percentage of cases. Thus, every patient infested with tropical parasites can definitely be treated today, both effectively and individually, and quite often there are even several drugs to choose from. However, the lack of infrastructure in these countries frequently makes a therapy and a follow-up of individual patients impossible. It is therefore both necessary and appropriate to treat large parts of the population at the same time, if at all possible. Tropical medicine now has at its disposal many active ingredients, some of which have led to spectacular successes in prevention and treatment. Chemical research can be expected to bring new important advances.

While discussing the subject of industrial research for tropical diseases, I should like to make a general comment — in the countries of the Third World, limited financial resources have resulted in the idea of saving precious foreign exchange mainly by means of rigorous qualitative and quantitative restrictions on the import of pharmaceuticals. Some countries think they can compensate for this by no longer allowing drugs to be imported under the protection of their registered trade marks, but only under generic names or in the form of pharmaceutical plagiarism. This involves the nonrecognition of pharmaceutical patents, arbitrary fixing of selling prices for imported drugs as well as other, frequently very expensive, restrictive regulations aimed at discriminating against foreign drug manufacturers in favour of local producers. Consequently, several important pharmaceutical companies have radically reduced their research effort in respect of tropical diseases because a fair return on investments made in this field can no longer be expected. Other companies have pursued their traditional research activities on tropical diseases in spite of all these facts, in the hope that the developing countries will abandon this misguided policy, in their own interests.

## ACTIVITIES OF THE INTERNATIONALLY OPERATING CHEMICAL INDUSTRY

After this review of the most urgent Third World issues, and the role chemical industry can play to improve the situation, the question arises: How can scientific progress be brought to the Third World most efficiently?

There is no doubt in my mind that this technology transfer can be accomplished best by free trade between the industrialized and the developing countries, and investment by the multinational chemical industry in those countries.

### *Foreign business activities*

The development of the chemical industry, which began in Europe in the middle of the last century, has been marked by foreign activities right from its inception. When a company accomplished an innovative breakthrough, the limited domestic market would not permit recovery of the high research and development costs within an adequate period of time. The company rather had to make an attempt to finance its research and development activities on as broad a basis as possible, that is by opening up foreign markets as well. Therefore, chemical firms are traditionally export-minded. At present about one fifth of Germany's chemical exports goes to Third World countries. Foreign investments by the chemical industry date back to the last century.

Chemical products, especially those used in manufacturing industry and in agriculture, require a special kind of marketing. It mainly consists in transferring to the customers the know-how needed to handle and to use the products in processing and manufacturing. The buyers of our products expect us to have chemists and engineers standing by all around the world to help them solve their problems.

### *From exports to investments abroad*

There are many reasons for manufacturing in foreign countries. Critical factors in such a decision are above all the markets themselves and their prospects for the future. The overall framework has to be marked by legal security, political and economic stability and essentially unrestricted transfer of capital.

In the Third World in particular, governments are rightly making plans for industrialization and the creation of new jobs. They invite foreign investments that have, however, to fit in with their plans, which limit our room for manoeuvre. Quantitative import restrictions and protective duties represent trade barriers that frequently cannot be overcome. Consequently, foreign investments are necessary; they are a bridge for technology transfer.

### *Investments in developing countries — a bridge for technology transfer*

In the three decades since 1952, the German chemical industry has invested 15 billion DM abroad, 4 billion DM, about 27%, of which in developing countries. These investments are focused on the basic needs of these countries, that is the fight against hunger and the improvement of health standards. It all began with the establishment of production plants for pharmaceuticals, veterinary products, plant protection products, and fertilizers.

For the most part, a sales organization staffed with scientists, businessmen and engineers had already been established in these countries. Starting from that basis, final production stages, that is formulation and packaging, of important products were gradually transferred to these countries. For this purpose, the chemical firms transferred not only capital but also their technological know-how. All these foreign production units are continuously kept informed about the most recent developments of the research laboratories at home. This was, by the way, one of the requests normally made by these countries, who insisted on being included in this technology transfer.

Investments followed the development of the markets. If markets could be opened up, the investments served not only to expand production capacities for individual products, but new manufacturing plants for other products were added. Finally, starting materials were also produced in the country itself. In India and in Brazil, for example, fully integrated plants were built that comprise many different production stages, from feedstock up to the final product. Such integrated chemical production activities require a lot of rather complex know-how and high capital expenditures; that applies for instance to dyes, intermediates, plastics, active ingredients for pharmaceuticals and agrochemicals as well as to many other chemical products. The sales volume that can be achieved has to be in a reasonable proportion to the necessary capital investment. This kind of production requires sufficient numbers of adequately trained personnel and a minimum of infrastructure. These conditions are only met in the advanced developing countries. The situation of the different developing countries varies significantly, ranging from relatively advanced countries standing on the threshold of industrialization, like Mexico, Argentina, Brazil and India to the, in this respect, almost undeveloped black African countries.

Problems encountered in connection with foreign investments are basically the same as with our investments in industrialized countries. The site of production is determined mainly by the market, which means that distribution channels have to be as short as possible and that production should take place near the customer. However, a number of other criteria are also important and have to be carefully investigated for every single country —

Are there sufficient numbers of — if possible, qualified — manpower?

What about the energy supply, how can water problems be solved?

Is there a guaranteed supply of starting materials, either via imports or by local production?

How does the government influence the economic activities of foreign companies, for example in the licensing of new plants or approval of products?

In this field, especially, many questions arise that all have to be examined and taken into account in investment decisions.

It is known from experience that foreign investments in developing countries encounter serious difficulties because of the inadequate infrastructure. Things that normally cause no problems in investments in industrialized countries, for example weatherproof roads, sewerage or sufficient energy supply, frequently do not exist in developing countries. In the case of certain investments it is not possible to wait for the government to take all necessary infrastructural measures. The investors have to create these prerequisites by themselves. This is not only time-consuming and expensive, it also reduces the economic position of these production units. Therefore, investing in developing countries is no easy decision. We are, however, convinced that our investments will simultaneously help to improve living conditions in the countries that are our partners.

*Cooperation requires a favourable investment climate*

In our activities we expect the developing countries to give us sufficient freedom of action for entrepreneurial work. We respect the legal system of our partners and always try to be good citizens of our host country. In many instances there is a wide gap between political plans and economic possibilities. Even great economic difficulties have never led us to take short-term negative actions, let alone complete abandonment. We consider our investments in developing countries long-term decisions that will not be reversed by political changes.

The practical results achieved in our production activities in developing countries are much better than might be imagined when considering some remarks made in connection with the North–South dialogue. In reality our partners are also primarily concerned with solving practical problems. There is a greater willingness to cooperate than one would believe in the face of some political statements. Years of partnership with these countries have created a sound basis of mutual confidence, which has been confirmed during many negotiations with government agencies.

The chemical industry looks back to many years of successful cooperation with developing countries. Foreign investment has a bridging function in the transfer of technology and promotes the industrial development of the host countries. We not only provide locally produced products, we also create new jobs, train manpower, improve the infrastructure, earn foreign exchange, and pay taxes. On the other side, we expect the developing countries to treat our investments with fairness, to put us on a par with domestic companies and to give us enough room for developing our entrepreneurial activities.

In transnational cooperation, both sides — the company doing business abroad and the host country — ought to orient themselves according to rules that both partners accept. In this respect the OECD Code of Conduct is an essential contribution. It can be considered as a cooperation standard and serves to bridge the gulf between the North and the South, as well as to strengthen international cooperation. Technology transfer can only exist in an atmosphere of cooperation between partners. The transfer of knowledge and experience is a process that should be a permanent institution. Our partners have access to the continuous flow of scientific and technical innovations and are constantly informed about the most recent technical developments. Developing countries frequently demand *free* transfer of technology. Demands like that are unrealistic when made from private business enterprises. These have acquired their technical know-how through decades of expensive research and development and are — for economical reasons — dependent on some financial 'return'. Only on this basis are they able and willing to continue the technology transfer. We are convinced that the most efficient development aid is actually guaranteed by the activities and the technology transfer of the multinational industries.

Technological progress determines the future of the chemical industry — cooperation and confidence determine the future of the industrialized countries and of the Third World.

## BIBLIOGRAPHY

The subjects covered in this presentation have been discussed in more detail in the following papers

1. P. Crabbé, A New Challenge for the University, UNESCO–IOCD International Seminar on Chemistry Food and Agriculture, Ljubliana, Yugoslavia, 26–31 August 1983.
2. N. E. Borlaug, R. G. Anderson, E. W. Sprague, The Human Population Monster, International Maize and Wheat Improvement Centre, Mexico, 1980.
3. Food and Agriculture Organization of the United Nations, 1982: *FAO Production Yearbook 1981,* Rome.
4. K. H. Büchel, The Societal Impact of Chemical Industry, UNESCO Training Programme, Course of Environmental Chemistry and Ecotoxicology, Sao Paulo, 17–28 October 1977.
5. Podiumsdiskussion, Forschung in der Chemie: Journalisten fragen — Wissenschaftler antworten, Heft 14, Schriftenreihe des Fonds der Chemischen Industrie, 1978.
6. K. H. Büchel, The Socio-Economic and Political Impact of the Agrochemical Industry in Relation to the Third World, 25th Anniversary Symposium, Society of Chemical Industry, Pesticides Group, London, 23 April 1979.
7. K. H. Büchel, Political, Economic and Philosophical Aspects of Pesticide Use for Human Welfare, 5th International Congress of Pesticide Chemistry (IUPAC), Kyoto, Japan, 29 August 1982.
8. K. H. Büchel, Der Beitrag der Chemie zur Sicherung der Ernährung, Festvortrag Deutscher Lebensmittelchemikertag, Braunschweig, 16 September 1982.
9. K. H. Büchel, Die Zukunft der Chemie in der Landwirtschaft, *Berichte über Landwirtschaft,* **61,** 382–399 (1983).
10. H.-J. Strenger, Auslandsinvestitionen — Brücke des Technologietransfers, Society of Chemical Industry, Wien, 17 October 1977.

# CHEMRAWN III Resource Material Conversion to meet Future Needs — (Bio)Chemical Process Bridges

The third CHEMRAWN Conference took place in The Hague, Netherlands, from 25 to 28 June 1984. As explained elsewhere, we had no report of the conference from our usual source but are grateful for the opportunity to use other people's impressions. Again as explained earlier, the first two reports are in some respects necessarily similar and arrive at much the same conclusions but, as neither is excessively long and they do illustrate slightly different approaches, are reproduced in full.

## NO MORE PANIC ABOUT RAW MATERIALS FOR THE CHEMICAL INDUSTRY.

(Summary of a report on the CHEMRAWN III Conference at The Hague, by F. Meijer and W. J. Mijs, reproduced in part from *Chemisch Weekblad* with permission.)

*There is no reason for panic about the raw materials position for the chemical industry. However, it seems clear that the chemical industry will gradually switch from oil to gas, coal and renewable raw materials in the long term. No uniform world-wide solution is to be expected for this switch, the situation differs from country to country. The intervening time will be needed to develop new (basic) technologies.*

*These are the main conclusions of the CHEMRAWN III Conference held in The Hague (Holland) from 25 to 28 June 1984.*

The most important conclusion of CHEMRAWN III is that much more time is available for switching gradually from oil to other resources. The oil stocks will suffice up to the *far* end of the 21st century. Furthermore energy savings have turned out to be higher than was expected in the seventies: 30% in a period of 5 to 6 years.

Nevertheless other raw materials such as coal, gas and renewable resources have to be investigated, but compared to the CHEMRAWN I in 1978 in Toronto the pressure is much less. In 1978 the oil crisis was still fresh in everyone's memory and in view of the strong dependence on oil of the western world it was not surprising that more than 800 attendees hurried to Toronto to discuss possible solutions. The CHEMRAWN III meeting in The Hague illustrated how strongly fear of a shortage of oil — and consequently resources — has been reduced. The longer time-schedule and the more gradual price increase for oil furthermore means that a more continuous R & D effort can be devoted to other resources for the chemical industry in the next century. After a period of consolidation, new technologies and connected new growth areas are now emerging. Correspondingly, interest in basic and industrial research is being revived. The rapporteurs Dr. W. J. Mijs and Dr. F. Meijer indicated some trends in this research for some areas in chemistry:

(i) invest in fundamental research (which is cheap compared to the development of a pilot-plant to study chemical reactions and processes). This also helps to design models for chemical processes;

(ii) develop Computer Aided Chemistry which makes it possible to shorten the long and expensive route between research and production. Possibly the pilot plant phase could then be skipped, entirely in some cases. Computer Aided Chemistry Technology (CACT) will yield processes with less variations, with a better product quality, using raw materials and energy better and also safer;

(iii) invest in research for raw materials and connected techniques to use and process them, because these materials are the key to new products and processes, e.g. light and strong construction materials; corrosion protective materials; materials which can be processed well and cheaply, for instance by reactive injection moulding; materials with extreme physical properties, such as new molecular structured semiconductors and electro-conductive polymers; ceramic materials with high temperature durability, usable under extreme chemical reactions.

According to Mijs and Meijer there was a striking uniformity about some rapidly growing areas: energy conversion systems, transportation systems, and communication and information systems.

# CHEMISTS AT CHEMRAWN CONFERENCE: ''WE'VE BEEN GIVEN MORE TIME''

P. Reinshagen

''The programmes drawn up at the end of the seventies are still valid. However, we how have more time to find better solutions.'' That is one of the conclusions drawn in the last week of June during the final session of the third CHEMRAWN Conference, where 250 top industrialists, scientists and government representatives in The Hague discussed the possibilities of chemical technology and the problems in the world. A second recommendation, following directly from the above, was that the extra time — created by the lessened demand for oil, large scale economies and new reserves — should be used well. Research programmes in the field of coal gasification and re-usable fuels, such as biomass, should be carried out.

In this respect CHEMRAWN III is the continuation of CHEMRAWN I, held 6 years ago in Toronto, Canada. There one of the conclusions was that the importance of oil (for fuel and chemicals) should diminish in 20 to 30 years' time. This time has been shifted forward to a point far into the 21st century, whilst transformation to other feedstocks will proceed slowly. ''This means'', said Dr. F. Meijer of Philips, on the last day when the conclusions were drawn in The Hague, ''that the general problem in the development of new chemical processes, based on new feedstocks such as coal, biomass, etc., is that economic feasibility is indeed very far away in time, except under very special local circumstances. It is highly improbable that private industry or even governments will invest heavily in the technology for a far distant future''. Another conclusion arrived at was that not all of the research programmes are suitable for all countries, a point which had already been made by Prince Claus of the Netherlands during his opening speech at the Conference. He stressed the importance of autonomic development of third-world countries, especially regarding their own products and with the aid of their own scientific knowledge.

The experts from chemical science and chemical industry were in general agreement during the 4-day Conference on the research and development programmes that can be drawn up for the entire world. It became clear that in research in the field of biotechnology especially, purification techniques will have to be given more attention, and also that development periods for new products before their application take longer than was originally estimated in the scientific world. Although biotechnology in and outside industry is going through important developments, we are only on the threshold of what may best be described as 'synthetic biology'. One of the possibilities to be looked into is the development of a vaccine against malaria, an illness which occurs approximately 300 million times per annum.

As far as materials are concerned the Conference concluded that quality-improvement with the aid of these new materials will be considerable. One could think of the application of more and more very high-quality man-made materials and different kinds of fibres in cars, or of new raw materials in microelectronics. On this point Dr. Meijer and Dr. W. Mijs (Akzo) said that the CHEMRAWN Conference showed the way ahead as: ''Invest in basic research (two fields that stand out are C1 and C5/6 chemistry); develop computer aided chemistry (CAC) in order to skip long and costly development and pilot plants and in order to find a shorter route between research and production; and also invest in research in new materials and the compatible techniques to use them.'' Most speakers stressed the need for a better and extended use of techniques, especially separation technology, membranes, specific adsorption cycles (using zeolites), and catalysts; and for materials for extreme chemical conditions and materials with extreme physical properties. In the very long term one of the possibilities of development could be a new kind of chemistry based on carbon dioxide, with the heat of nuclear fusion as a new source of energy. In biotechnology the problem of the low velocity of chemical reactions carried out by microorganisms could in the future be improved by DNA recombinant methods.

**Dr. B. W. Rossiter, Chairman of CHEMRAWN Committee, IUPAC, addresses the Conference**

Although at this moment no limitations are foreseen in the raw materials situation or the right technology to provide new and better products, this does not mean that these can solve the social problems existing in the world. The Conference discussed these problems *in extenso*, but came to the conclusion that the gap between the developed and the less developed countries is widening, largely because of the difficult financial situation of many third-world countries.

The conclusions and recommendations of the CHEMRAWN Conference will be published as a book before the end of the year and will be sent to many governments and organizations. These recommendations will be spread further by means of local conferences and personal contacts. It is hoped that further discussions on this subject will start in this way, since "technical sciences and social sciences form the two sides of the same coin".

Dr. Dermot O'Sullivan, of *Chemical and Engineering News*, emphasized the following points made during the Conference:

Computer predictions suggest that oil will continue to be available as a prime feedstock for about 100 years but this is no cause for complacency. Research efforts must intensify on the development of alternative energy sources, energy conservation and improvement of petroleum extraction techniques. More emphasis should be placed on the use of natural gas as a feedstock.

Growth rates for bulk chemicals have slowed considerably — the markets for them are becoming saturated. What growth there is may well be absorbed by the petroleum exporting nations who are expanding their interests in production plants for chemicals. The demand for speciality chemicals will, however, increase rapidly.

Probable growth areas are biotechnology, functional devices in microprocessing and communications, and novel high-performance materials.

Although biotechnology has potential for valuable application in the areas of pharmaceuticals and health care, development of new plants that are resistant to disease and can 'fix' atmospheric nitrogen directly, improvements in food processing, its use for producing basic chemicals from agriculture feedstocks or carbon dioxide is fraught with difficulties — not least the separation of the required materials from large aqueous volumes. This might, however, be overcome by development of specially designed membranes or of new zeolite molecular sieves.

*Editor's note:* It is hoped that the salient points from this latest CHEMRAWN Conference can be seen in the above reports but if anything vital has, in your opinion, been missed a 'Letter to the Editor' should put the matter right.

I am pleased to acknowledge the assistance of Ir. E. J. de Ryck van der Gracht, Secretary of the Royal Netherlands Chemical Society, for his help in various ways, Dr. W. J. Mijs (a member of COCI) who translated the extract from *Chemisch Weekblad*, Drs. Ing. P. Reinshagen, Press Officer for CHEMRAWN III, who wrote his article specially for CI and provided the photographs, and Dr. Dermot O'Sullivan (a member of the Committee on Publications) for providing me with his impressions, which I hope I have interpreted correctly.

**Discussions at coffee break. From left to right: Prof. J. Tinbergen, Nobel Laureate; Prof. W. J. Beek, Chairman of CHEMRAWN III; Mr. G. A. Wagner, Royal Dutch Petroleum Company**

# Chemists have wide job opportunities — if they care to take them

## Comments on the lecture by Prof. H. A. Staab on Problems at the Interface of Educational and Employment Systems

In CI, 1984, No. 3, pp. 2–5, we reproduced Prof. Staab's lecture, given in Copenhagen, 1983, to the meeting of Chemical Society Presidents. At the meeting comments were invited from other Chemical Societies so that the situations in other countries might be compared with those in West Germany. I am grateful to Prof. P. O. Larsen (Denmark), Prof. J. Inczédy (Hungary) and Dr. R. D. Guthrie (UK) for permission to reproduce the comments of their Chemical Societies. I hope Prof. Larsen will forgive me for using an adaptation of his title as my main heading — it seemed very appropriate. — *Editor.*

### DANISH CHEMICAL SOCIETY

Prof. Staab's paper raises many important problems concerning the present and future prospects of the chemical profession. Even though the examples are from West Germany, the problems are to a high degree the same in many other countries, including Denmark where the weak points described by Prof. Staab are also found. For example, our students are at a high age when graduating, we have almost no permanent university positions in chemistry to fill for the next 10–15 years, and we have only a few available jobs where chemists can work in precisely the field in which they have been trained. In addition, we have a number of national peculiarities which further worsen the situation. Interesting as these peculiarities may be for ourselves, they are unlikely to be so to a wider audience. I want, however, to make a number of comments of a more general nature to Prof. Staab's paper.

It is important to realize that a chemist and a job for a chemist are not very well or narrowly defined. There is no sharp border between chemists and other people and between, on the one hand, jobs which are only open for chemists and which only chemists can fulfil and, on the other hand, jobs only open to non-chemists. Therefore, there is also no simple supply and demand situation for chemists. It is an over-simplification to say that chemists must work in their field or in the profession for which they are trained.

At least in Denmark, chemists on the job market are competing with many other graduates including pharmacists, biologists, veterinarians, food technologists and medical graduates. They are also competing with persons trained for administration and with non-academic groups. This partly reflects the fact that there are many border-line jobs, for example in food control, in hospital laboratories, etc. It also reflects the fact that the job market, the positions available and the new positions created every year, is changing much faster than academic curricula. The change is also so fast that basic university training will not last — there is a continuous demand for readjustment and retraining. After all, very few people are doing precisely what they were trained for and some are doing completely different things. This is certainly not new — but today it is so important that it is not advantageous to consider chemistry as a closed profession. The jobs in modern society are done; the positions are filled. The question is — who will do these jobs?

**Prof. P. O. Larsen, Danish Chemical Society**

Chemists have valuable assets in an everchanging job market. They have a knowledge of chemical language, of scientific language and of technical language. Those who have no knowledge of these languages, and therefore cannot express themselves in these languages, are in many respects in a very weak position in modern society, losing job opportunities and not being able to cope with many problems. To quote the comments from the Royal Society of Chemistry, chemists have numeracy, analytical and investigative thinking coupled with a broad attitude of mind. This is certainly valuable luggage!

Maybe there will be too few jobs for university graduates in the coming years. Maybe there will generally be high unemployment. But those who will succeed will be those with flexibility, those who know how to adjust. This goes for countries, for professions, and for young and old.

Chemists deserve to succeed because they have something to contribute. They will only succeed if there is flexibility in all age groups. There will be demand for young graduates who have learned chemistry well by concentration, who have learned something in depth and who have also learned something about the society in which they have to work, the society which, after all, feeds us all. There will be a demand for young graduates prepared to do the jobs needed to be done. They must consider chemistry as an opening to a wide spectrum of jobs in the coming society. There will also be a demand for the older chemists who can adjust to changing problems and opportunities. Only with such an attitude will they be able to turn out young chemists with good prospects.

**Submitted by P. O. Larsen**

## HUNGARIAN CHEMICAL SOCIETY

The problems emphasized and commented on by Prof. Staab in his lecture are, I think, quite general and very similar in almost all European countries, irrespective of their geographical situation. This comes from the fact that all the problems mentioned — growth in the number of people with high school or university degrees, high birthrate after the war, the slow decline of birthrate in the last few years, etc. — influence the education and employment interfaces similarly. As a matter of fact, in small countries — like in Hungary — we have very similar problems.

This situation seems now, of course, pessimistic, since quite a few young people with excellent abilities and education no longer have the job possibilities of earlier years. However, due to the educational system of the country, *ca.* 66% of chemistry graduates are chemical engineers. The qualifications of the latter type "chemists" give wide opportunities.

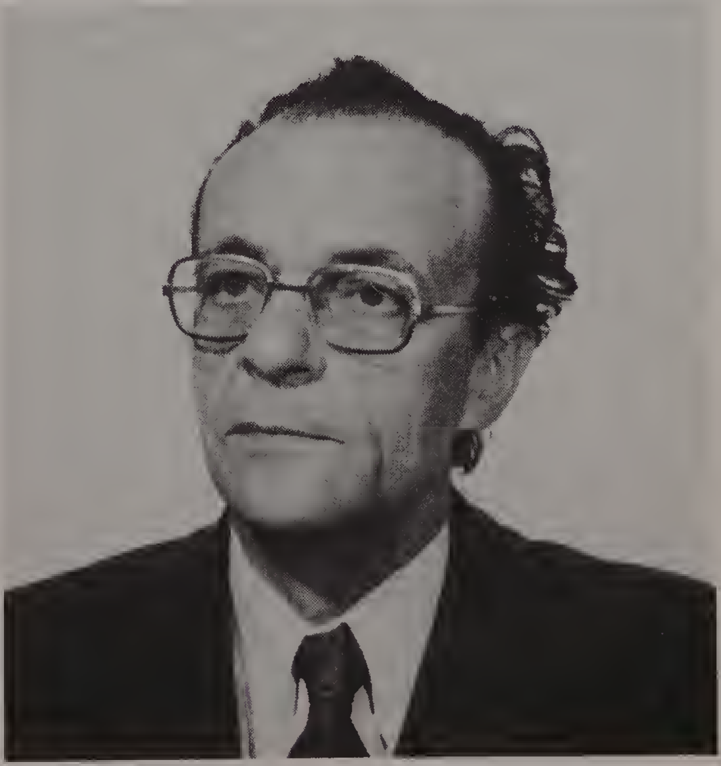
Considering the problems of Europe — energy problems, raw material problems, environmental pollution problems, computerization, etc. — the work of experts who also have basic knowledge of chemistry is needed. Similarly, activities which are important in modern life — hygienic control, medical service, laundry, etc. — also need the work of chemists or of technical experts who know basic chemistry. Today the role of chemistry is extended to almost all fields of human activities.

If the education system is not too rigid, and not only 'pure' chemists but more 'convertible' chemists with technical knowledge — measurement, computer techniques, technology, units operation, process control, systems techniques, etc. — are produced, education and employment may be interfaced more readily.

Because of the problems mentioned, we introduced, or are introducing, such new forms of education at the technical universities, where the same fundamentals (mathematics, physics, chemistry, etc.) are taught at the first level while certain special subjects are obligatory at the second level. Thus there are chemical engineering students studying factory management, measurement techniques, biotechnologies or the traditional chemical (oil, organic, inorganic, etc.) technologies.

We know only too well that all the problems introduced by Prof. Staab can not be solved as discussed above. However, we think that, by dissolving the old rigid eduational system and emphasizing convertibility rather than narrow specialization, education can help young people with their professional problems and also society as a whole. We can thus overcome the existing problems more easily.

**Submitted by J. Inczédy**



**Prof. J. Inczédy, Hungarian Chemical Society (and Commission V.1)**

## ROYAL SOCIETY OF CHEMISTRY

### *Numbers of students studying chemistry*

It is not very useful to discuss total numbers of students in the system as course lengths are so different. Instead we have concentrated upon annual output of graduate (University + CNAA + GRSC) chemists. There has been comparatively little change over the past 15 years — a minimum 2200 was reached in 1977, recovering to 2800 in 1982. However the proportion of students studying chemistry declined from over 5% in 1967 to 2.8% in 1977, before recovering slightly to just over 3% in 1982.

### *Demographic Factors*

The UK age participation rate in higher education (HE), i.e. the proportion of 18-year-olds in full time higher education, has also remained little changed over more than a decade, remaining between 13–14% compared with the current West German figure of about 20%.

The number of 18-year-olds in the UK population has just reached its maximum and will decline by about a third over the next decade. It would, however, be too simplistic to assume that the demand for higher education will show a similar trend. The birth rate amongst the upper socio-economic classes, which provide a high proportion of students, has not declined nearly so sharply, so that the age participation rate would have to be increased to maintain opportunity for those qualified and seeking a place in higher education.

### *Supply of graduates and its relationship to employment opportunities*

Experience in the UK suggests that market forces cannot wholly explain choice of subject in HE. Even with our comparatively short three to four year courses, the employment crisis in 1970 and subsequent years led only to gradual (5% p.a.) decline in the number of chemistry graduates, the trend 'bottoming out' in 1977. Indeed the numbers of students *entering* chemistry courses had started to decline two or three years before the headlines over poor job prospects.

On the other hand it may be that in the 1980s worries about employment prospects are more acute and that market forces will dominate, albeit with a long lead time.

### *Availability of academic positions*

The UK situation is similar to that in West Germany, with very few openings. The only difference is that UK recruitment has been stagnant for rather longer. New blood schemes can make only very small inroads into the problem and there have been some worries about the quality of those in the pool.

### *Employment patterns of BSc and PhD chemists*

Of the three principle categories of UK chemistry graduates, almost all the GRSCs go into, or are already in, industrial or public sector laboratories; data on the first destination of CNAA graduates is not very reliable, which leaves the 75% or so who graduate from Universities. Of these 30–35% have consistently pursued further study, usually for PhD, and a fluctuating proportion (up to 10%) undertake teacher training. The proportion entering permanent UK employment has varied between 30–40% over the past 15 years and is currently (1982) 31%. Unemployment is 14%.

The nature of the employment taken up by these people has changed markedly since 1970 when the chemical industry halved its intake in two years. There has been no major recovery since that time. Chemistry graduates have found their skills to be marketable in such areas as finance, commerce and computing. A close look at the data shows changes in destinations of BSc chemists entering employment:

*Proportions of University Chemistry BScs going directly into employment*

| *Year* | *Oil/Chemicals (%)* | | *Commerce/Finance (%)* |
|---|---|---|---|
| 1977 | 38 | (3:1) | 12 |
| 78 | 36 | | 14 |
| 79 | 37 | | 14 |
| 80 | 34 | | 16 |
| 81 | 31 | (1.5:1) | 20 |

At the first degree stage, therefore, chemistry graduates going into the chemical industry represent only about 10% of university BSc chemistry output.

There are approximately 700–800 PhD graduates (including overseas students) *per annum*. In 1982, 474 were supported by the SERC. Of these 35% went directly into chemistry-related employment, 21% stayed in HE, mainly as 'post-docs' and 25% took employment outside chemistry. For some time, therefore, BSc and, to a lesser extent, PhD graduates have either sought, or have been forced to seek, employment outside chemistry and have done so successfully.

### *Unemployment among young chemists*

Since 1977 unemployment among professional chemists aged under 30 has more or less quadrupled to around 3% of those available for employment (likely to be fresh employment). Among student members (who may be seeking first employment) unemployment was 14% in 1983 for all qualifications; for those with a bachelor's degree, it was 21% and for those with a higher degree, 18%.

*Chemistry as a preparation for non-chemical careers*

As already stated, chemistry graduates in the UK compete successfully and enjoy satisfying careers which do not use the subject matter of their degrees. The qualities of numeracy and analytical and investigative thinking coupled with a broad attitude of mind enable them to make their mark in a wide variety of fields. This should be welcomed as a valuable contribution to the scientific literacy of the population at large and not viewed as a waste of talent and resources.

*Programme to bridge the gap*

These short term appointments seem only to be putting off the evil day, delaying the entry of PhD graduates onto the permanent job market for a few years at which time output from universities will be even greater. By UK standards, new German PhD graduates would not be described as young. UK PhDs obtain their first jobs at about 24–25 years of age. At this stage in their careers the costs of employing them are lower both in terms of salary and of technician support which does not usually come until after a few years' experience.

*Conclusion*

A former President, Sir Fred Dainton, said that chemistry is an arts degree with a bonus. We see no reason to dissuade students who are interested in history, fine art, music from further study in these areas. The same should be true for chemistry. It may be necessary to 'liberalize' first degree courses and, perhaps, alter the nature of postgraduate study, but to reduce drastically the numbers of students permitted to study chemistry would be to the detriment of the students and, ultimately, to the level of scientific understanding in the country as a whole.

**Submitted by R. D. Guthrie**

# DIVISION PRESIDENTS

## PROF. F. PELLERIN

### Analytical Chemistry Division (V)

Prof. Fernand Pellerin was born in 1923 in Normandy and studied at the Faculté de Pharmacie de Paris as Pharmacist. He was appointed Assistant in the Faculté in 1949 and, in 1955, Chef de travaux (lecturer) in analytical chemistry. He gained his Doctor es-Sciences pharmaceutiques and after successfully completing the concours d'agregation de l'enseignement supérieur in 1964 (diploma in higher education), he moved to the Faculté de Médicine et Pharmacie de l'Université de Rouen as Professeur agrégé (senior lecturer) in analytical chemistry, becoming Professor in 1969. In 1979 he returned to Paris as Professor of Analytical Chemistry at the Faculté de Pharmacie de l'Université de Paris Sud.

Prof. Pellerin is an analytical chemist who has developed his research activities along two lines. The first is organic functional group analysis, including study of organic solvents for protometric and functional analytical reactions in two-phase solvent systems, and various chromatographic and spectrometric studies on the reactivity and stability of organic molecules as a function of their structure. The second line involves studies on analytical chemistry applied to

Prof. F. Pellerin, President, Analytical Chemistry Division (V) pharmaceuticals: under this main heading he has examined two aspects — first the study of methods of quality control and of additives (colours, preservatives, antioxidants) and, second, studies of the interactions between plastics and pharmaceuticals or biological media. In this work he provides explanations of these interactions by consideration of the relationship between the physicochemical properties, the structure and composition of the plastic materials and on the other hand the chemical reactivity and structure of drugs and pharmaceuticals.

Prof. Pellerin was elected on to Commission V.1 as a Titular Member in 1968, becoming Commission Secretary in 1971. In 1975 he relinquished this Office, and became an Associate Member of the Commission (until 1979), on his election to the Analytical Chemistry Division Committee. He was elected Vice-President in 1979 and assumed the Office of Division President in 1981. In addition to his Division V work, he was Secretary of the Coordinating Committee for Analytical Methods for CEE and IARC from 1972 to 1977, when he became Chairman until its dissolution in 1979.

## PROF. F. W. SUNDERMAN, JR.

### Clinical Chemistry Division (VII)

Prof. F. William ('Bill') Sunderman was born in Philadelphia, Pennsylvania, USA, in June 1931. He was awarded his B.S. in 1952 by Emory University, Atlanta, Georgia, and in 1955 his M.D. at Thomas Jefferson University, Philadelphia, where, after a year as an Intern in the Hospital he was appointed a Fellow in Medicine. In 1958 he moved to the US Naval Medical School, Bethesda, Maryland, as Chief of the Clinical Chemistry Service, transferring in 1960 to the National Institutes of Health. In 1961 he returned to Thomas Jefferson University as Instructor in Medicine. 1964 saw another move, to the University of Florida College of Medicine, Gainesville, where he was Associate Professor of Pathology until 1967 when he became Professor. In 1968 he settled in Farmington, Connecticut, when he was appointed Professor and Head of the Department of Laboratory Medicine, University of Connecticut Medical School. In 1979 he was also appointed Professor of Pharmacology.

Prof. Sunderman's research activities have covered a very wide range of subjects and techniques but his main effort has been concentrated on the clinical biochemistry of nickel and the toxicology and carcinogenicity of nickel compounds — his first paper on nickel was published in 1958 and the latest is in press. He is particularly proud of achieving the establishment of the Nickel Subcommittee of Commission VII.4 and of the collaborative development of the IUPAC reference method for analysis of nickel and serum in urine.

Prof. Sunderman was elected to the Section Committee of the (then) Section on Clinical Chemistry in 1971 where he served until 1977. He was elected Vice-President of the (now) Clinical Chemistry Division in 1979 and became President in 1981. He was Chairman (and founder-member) of the Commission on Toxicology in 1973 where he remained until 1981. He founded the Subcommittee on Environmental and Occupational Toxicology of Nickel in 1975 and was its Chairman until 1983. He has been IUPAC representative on IFCC since 1981 and on IUTOX since 1982. He became an Associate Member of JCBN in 1984.

In addition to his scientific achievements, Prof. Sunderman is an accomplished violist and a member of the Talcott String Quartet, New England. He is also senior member of the 'Sunderman Family Quartet' with Fred (17, cellist), Libby (16, violinist) and Emily (12, violinist).

**Prof. F. W. Sunderman, Jr., President, Clinical Chemistry Division (VII)**

# Low-cost Equipment for Chemical Education

## An IUPAC-CTC Project

by Prof. K. V. Sane
CTC 1981–1983

A pilot project for design and fabrication of low cost equipment for chemical education was initiated at the University of Delhi in late 1979 by the Committee on Teaching of Chemistry (CTC) of IUPAC in collaboration with UNESCO and, later, the Committee on Teaching of Science (CTS) of ICSU. The general and the specific as well as the technical and non-technical aspects of the Project have been reported elsewhere*. It will therefore suffice first to outline the essence of the project and then proceed to examine (i) some follow-up measure which can consolidate the gains and (ii) some aspects which can have relevance to other problem areas in chemical education.

There is understandably a widespread concern at the deteriorating quality of laboratory instruction in chemistry. Amongst the many factors,. the principal ones are perhaps the rising costs and rising sophistication of chemical instruments. The former is making it increasingly difficult to equip a student laboratory; the latter is making it increasingly difficult to maintain what equipment is purchased. The situation has become particularly acute in many developing countries where history (absence of a scientific tradition), sociology (reluctance to work with hands) and economics (scarce funds) are conspiring to make science teaching unscientific by progressively diminishing the quality and the extent of the laboratory component.

This dismal picture is, however, not without hope. Many developing countries are now witnessing the growth of electronics and materials technology which heralded the space age in the developed countries in the sixties. As is well known, the falling prices of the latest electronic devices, coupled with their versatility and ease of handling, make them an ideal choice for a low-cost do-it-yourself approach to instrumentation. However, if these events are to make a substantial impact on the educational scene in the developing countries then a strategy has to be devised which views instrumentation not as an end in itself but as a means of catalysing certain much needed changes in teaching methods.

### THE PROJECT

An interdisciplinary team consisting of chemists, physicists and technicians has evolved at the University of Delhi in the last five years to give the Project a firm direction. The team has so far designed low-cost versions of several instruments, accessories and experiments suitable for use at the junior university/college and senior school level. An essential feature has been the involvement of a large number of students through informal project work during vacations and holidays. Another feature has been the exclusive use of made-in-India components. Since none of the workers — teachers and students — have any prior training in electronics and instrumentation, everyone is learning-by-doing which has helped to create an atmosphere where the stress is on simplicity.

The instruments chosen for development include pH meter, conductometer, colorimeter, polarimeter, thermometer and polarograph; the accessories include electrodes, conductance cells, thermocole-based thermos flasks, and magnetic stirrers; experiments include selections from different branches such as organic, inorganic, physical, biological, industrial, agricultural and environmental chemistry. Several designs of a given piece of apparatus have been made to suit different requirements. For example, eight models of a pH meter are available, accommodating different options like battery/mains operation, low/high impedence, high/medium accuracy and low/ultra-low cost. Similarly a conductance cell has designs which can be made with or without soldering facilities. The prices range between US$ 8 for a very simple conductometer and polarimeter to US$ 50 for an all-purpose high-

---

*For example, see:
(i) *Locally Produced and Low Cost Equipment and Experiments for Chemistry Teaching,* Vol. 1 (1982) UNESCO/IUPAC Publication.
(ii) *Proceedings of the Copenhagen Workshop on Locally Produced Equipment (1983).*

Limited copies are available on request from:

Prof. D. J. Waddington,
Department of Chemistry,
University of York, Heslington,
York YO1 5DD, UK.

Dr. J. V. Kingston,
Division of Scientific Research & Higher Education,
UNESCO, 7 place de Fontenoy,
75700 Paris, France.

accuracy pH meter and a good performance colorimeter. Almost all the accessories, with the exception of a magnetic stirrer, are virtually zero-cost since they are made from discarded materials such as carbon rods of discharged dry cells, thermocole packings, etc.

The development work described above is one aspect of the project; the other is the propagation work. As long as the activity is limited to a single group and a few instruments, it will have negligible impact. The crux of good teaching and learning is attitude and not instruments, chemicals or similar materials. Attitudes, however, cannot be cultivated by mere platitudes; it is necessary to provide a framework where enthusiastic teachers and students have opportunities to experiment, to create and to evaluate. The use of locally-available, inexpensive, durable, safe and versatile electronic devices and other materials offer today unparalleled opportunities to initiate similar projects in Third World countries. To catalyse this process, a series of Workshops have been held where participants are introduced to the philosophy of the Project followed by laboratory sessions involving designing, fabricating and testing simple instruments. Beginning with an International Workshop in Madras in April 1981, four such Workshops have been held in India, with the support of national agencies, and others have been held outside (namely Brazil, Guyana, Bangladesh), with the support of international and regional agencies. There has also been a European Workshop held in Copenhagen.

It is important to emphasize that the Project — either in its developmental aspect or in its propagation aspect — is not attempting anything new. Chemical literature is replete with references to the use of electronic devices, such as an operational amplifier, and electrodic materials, such as a carbon electrode, for teaching and research purposes. If the Project can claim any novelty at all, it is in the sum total of its efforts and not in the individual parts. To appreciate this point, it is useful to examine the key features of the Project.

## KEY FEATURES

*International sponsorship:* Sponsorship by professional organizations like IUPAC and ICSU has helped to highlight the urgency of the problem, provided avenues for global exchange of information and for international collaboration, and offered expert scrutiny. There is no doubt that international organizations can be very effective catalysts for initiating action in many problem areas in science education of relevance to developing countries, if not to the whole world.

*Interdisciplinary core group:* A joint effort by chemists, physicists and technicians enables a balanced consideration of theoretical and practical matters and of fundamental and applied aspects. It also enables development of a package where the various pieces match with each other in cost, convenience and performance. To illustrate this point, consider the example of a pH meter. It is easy for a physicist to develop a circuit, for a chemist to make an electrode system, and for a technician to design the layout. However, unless the three parts are compatible in pricing, accuracy and convenience, the overall set-up has not achieved an optimum design. (Of course, there are some versatile individuals who are chemist, physicist and engineer rolled into one but, since samples of such exotic species are rare, ordinary mortals have to learn to cooperate with one another!)

*Emphasis on quality:* The term ‘low-cost’ has unfortunately become synonymous with low quality. It is extremely important that, in a Project like this, quality should never be compromised. The objective is not to produce an apparatus which is merely cheap but to make one which, in addition, meets the demands of accuracy and precision required at a particular level (e.g. school, college) and for a particular purpose (e.g. titration, absolute measurement).

*Participation of students and teachers:* This is one of the crucial features. The use of teachers and students in designing, fabrication, testing and evaluation creates a sense of involvement besides generating confidence and expertise required for more ambitious efforts. The ability to maintain, repair and modify routine equipment is an important offshoot.

*Linking training with production:* In a majority of Workshops the participants have not only been introduced to the circuit design, its operation and functioning, but they have been encouraged to assemble at least one complete unit. Thus in the week-long Hyderabad (November 1982) and Guyana (August 1983) Workshops participating teachers made about 20 instruments; in the 3-week Delhi (June 1983) Workshop, 12 students made 50 instruments. The fabricated equipment has been distributed to appropriate institutions under the auspices of the Workshop-sponsoring agency.

*Reliance on locally-available materials:* The long-term and an assured growth of the Project demands that it depends only on easily available local materials. From an academic viewpoint this is a useful restriction — it teaches how to attack a problem subject to various constraints.

In a nutshell, the most significant exercise in this work appears to be its attempt at various types of interfacing (e.g. international/national; low-cost/high-quality; chemistry/physics; teachers/students; training/production) *simultaneously*. Each of these interfaces is felt to be sufficiently crucial that neglect of any of them will distort the underlying philosophy and manner of operation in a significant way.

### PROSPECTS

The IUPAC Project at Delhi has, without doubt, made a good beginning thanks to the receipt of timely moral support from the academic community and the equally timely financial support from the funding agencies. To consolidate the pilot phase, which at times has been characterized by an *ad hoc* approach, it is necessary to place the Project in a wider perspective.

An academic framework for the Project can be conceived at three different levels. At the first level, the present activity only needs to be structured in such a manner that it can undertake systematic development of all the major pieces of equipment needed in the teaching of chemistry at the school, college and University levels. The propagation work will also have to be pursued in a systematic manner by organizing training programmes and Workshops to establish seed groups in major regions (e.g. South Asia, Caribbean) who in turn will assist formation of seed groups within individual countries. The adaptation and propagation within a country is, of course, best left to suitable individuals and the national agencies in that country. To mastermind this effort, an international advisory committee should be constituted by IUPAC in association with major funding agencies. This committee could be entrusted with the formulation and implementation of a 5-year action plan.

At the second level, it is useful to realize that the six key features of the Delhi Project can be utilized to organize pilot activity in other areas of chemical education of concern to the developing countries. These include:

(a) a low-cost chemicals project in which synthesis, recycling and use of micro methods can be adapted to cut down the costs,
(b) an audio-visual project for developing various aids like charts, tape slides, audio and video cassettes and films, and
(c) a microcomputer project in which appropriate software for chemical education can be developed.

The third level should concentrate on integrating the different activities. This can be done by initiating a Chemistry Curriculum Development Programme where the material produced from the individual projects is amalgamated with a suitable text, teachers' guide and a problem-solving manual to form the outlines of a modern Chemistry Curriculum which can provide a base for regional and national adaptations.

The full programme is admittedly ambitious. But then such challenges should be willingly accepted by a first-rate professional body like IUPAC as it can give chemistry teaching all over the world a very constructive direction for the coming decades.

*Acknowledgement* – I am most grateful to UNESCO for the initial major funding of this Project and also to IUPAC CTC, ICSU CTS and COSTED for sponsoring various Workshops. The University Grants Commission, New Delhi, has given invaluable help in backing the Project within India.

Prof. Sane's present address is: Department of Chemistry, University of Delhi, Delhi–110007, India.

---

## IUFoST Symposium

A symposium sponsored by the International Union of Food Science and Technology and the International Union of Nutritional Sciences on Chemical Changes during the Processing and Storage of Foods will be held in Valencia, Spain, 5–7 November 1984. Further information can be obtained from Dr. S. Barber, IATA, Jaime Roig 11, Valencia 10, Spain.

---

## International Union of Crystallography (IUCr)

The 14th IUCr General Assembly and International Congress of Crystallography will be held in Perth, Western Australia, 12–20 August 1987. Further information may be obtained from Dr. E. N. Maslen, Crystallography Centre, University of Western Australia, Nedlands 6009, Western Australia.

# OTHER PEOPLE'S PUBLICATIONS

## Association of Official Analytical Chemists (AOAC)

### Quality Assurance Principles for Analytical Laboratories

Each chapter of this 224-page volume gives information on a particular phase of quality assurance considered essential for a good quality QA system, including attention to management of personnel, quality costs, supplies, equipment and records. It suggests approaches to sampling, sampling analysis, proficiency testing, use of control charts, instrument servicing and calibration, and facilities design and safety. Forms, reliable practices, procedures and information used by US Federal agencies are offered as examples and suggestions and recommendations are put forward at the end of each chapter. Information on several laboratory accreditation programmes is given, and certification, licensing and registration of chemists are discussed.

The book is available from AOAC at US$48.50 (US$45.00 in USA). ISBN 0–935584–26–9.

## European Federation of Biotechnology (EFB)

### Process Variables in Biotechnology

This volume is the result of a study by the Working Party on Bioreactor Performance of the EFB. The factors of significance in the characterization of bioreactors and fermentation processes have been discussed in detail by the Working Party members from the points of view of biochemistry, microbiology and engineering. Most sections contain theoretical fundamentals as well as the construction and working principles of measurement probes. The constraints and particular problems associated with the determination of the process variables are listed and discussed for each section.

The 135-page study is published in English by DECHEMA, price DM30 (plus handling charges).

## European Photochemistry Association (EPA)

**EPA Newsletter, July 1984.** Articles on photochemistry in Spain and in the German Democratic Republic. Discussion on nomenclature of photocatalysis. Reports on the European Postgraduate Symposium on Photochemistry, April 1984, and on the Workshop on the Nature of the So-called TICT States, June 1984. Two technical reports — *Some useful formulae for the evaluation of the A → B photoreaction system; Ferri-oxalate actinometry.* Lists of new books and recent theses on photochemistry. Forthcoming conferences and symposia.

## International Council of Scientific Unions (ICSU)

**ICSU Newsletter No. 18, June 1984.** Decisions of 40th Meeting of the Executive Board. Programme for 20th General Assembly of ICSU, September 1984. Report on SCOPE–ENUWAR workshop, Leningrad, May 1984, on the environmental consequences of nuclear war. Preview of CHEMRAWN III. The future role of COWAR. Activities of COSTED. Recommendations by ICSU Press for the basic elements of a publications contract for a journal. Arrangements for sabbatical leave in Spanish laboratories.

**ICSU Lectures 1982.**
The three lectures published in this booklet were given at the 19th General Assembly of ICSU in Cambridge, 1982, and follow a long line of ICSU Lectures dating back to that on The Problem of the Figure of the Earth given by Prof. N. E. Nörlund at the 3rd General Assembly in 1937.

The first two lectures — One Hundred Years After: Poles of Uncertainty in Our Earth by Prof. G. D. Garland, and A Centenary of International Cooperation in the Study of the Earth by Prof. V. V. Beloussov — form part of the commemoration of the anniversaries of the First International Polar Year (1882–1883), the Second International Polar Year (1932–1933) and the International Geophysical Year (1957–1958). The third lecture, by Dr. M. F. Perutz, is on The Impact of Science on Society: this is a subject that has been of concern to ICSU for almost 50 years — ICSU began to study this question in 1934 in cooperation with the Committee of Intellectual Cooperation of the League of Nations.

## ICSU Committee on Data for Science and Technology (CODATA)

**CODATA Newsletter No. 29, July 1984.** Article on 'CODATA's Beginnings' by F. D. Rossini, CODATA's first President (1966–1970). Formation of a Working Group on Coordination among Protein Sequence Data Banks and of a Task Group with listed terms of reference. Report on a Symposium on Standard Reference Data in Physical Chemistry, USA, April 1984. Report on incentives for evaluators. An interview with Dr. H. J. White on thermodynamic tables.

### Database Management in Science and Technology

This xiv + 264-page book is a CODATA sourcebook on the use of computers in data activities. It is designed as an introduction for scientists into the use of computers to store, manipulate and distribute collections of numeric data. The ten chapters, each written by an expert in scientific database management, cover three main topics — an overview of the concepts, a detailed discussion of each phase of a database project and, finally, a discussion on computer communications and linkage to other scientific database work.

The book is published by North-Holland Publishing Company, price US$45.00. ISBN 0-444-86865-8.

### International Union of Pure and Applied Biophysics (IUPAB)

**IUPAB News, July 1984.** Report from the IUB–IUPAB–IUPAC Commission on Biothermodynamics. Summary report of SCOPE activities, 1983. Report on the Macromolecular Division of IUPAC.

## CNC–IUPAC

Twice in CI (1983, No. 3, p. 29 and 1984, No. 3, p. 25) has reference been made to CNC–IUPAC and both times we've got the full name slightly wrong — it is actually the Canadian National Committee *for* IUPAC (did anyone spot the mistake?). This Committee is operated by the Chemical Institute of Canada (CIC) for the National Research Council of Canada, the actual IUPAC National Adhering Organization, and is the body most directly concerned with ensuring liaison between Canadian chemists and IUPAC. The success of this Committee can be judged by a glance at p. v of the *IUPAC Handbook 1983–1985* — or at the inside back cover of this issue of CI!

Unfortunately our President was unable to attend the meeting at which the photograph was taken but some of the other faces should be familiar. Dr. Renzoni is the retired Vice-President for Research and Development of Inco Ltd. and Mr. Michael serves as Secretary in his capacity of Executive Director of CIC. We are grateful to the latter (Managing Editor) and Dr. Anne Alper, Editor, of *Canadian Chemical News/L'Actualité chimique canadienne* for permission to reproduce the photograph.

**The CNC-IUPAC Committee at a recent meeting: J. R. Bolton, W. C. Purdy, C. B. Alcock, T. H. G. Michael (Secretary), L. S. Renzoni (Chairman), G.G.S. Dutton, H. Favre, J.E. Guillet, D. B. Tonks, C. Gauvreau and P. R. Desjardins.**

# SUMMARY MINUTES OF COMMITTEE AND COMMISSION MEETINGS

## **Advisory Committee on Chemical Data Bases:** London, UK, 19–20 June 1984

The principle conclusions reached by the Committee were:

1. IUPAC should establish a source of computerized data bases to provide an output mechanism "in parallel with hard copy publications" for the data compilation efforts of its Commissions.
2. Oversight for data bases activities should be provided by a Standing Committee, analogous to the Publications Committee, whose functions would include:
   (a) recommending policy to the Officers of the Union,
   (b) implementing procedures for control of the scientific quality and format of data bases,
   (c) conducting negotiations with distributors.
3. One member of this Standing Committee should be designated as the "IUPAC Data Bases Coordinator". He should work with the Commissions on the design of data files and assure uniform progress across IUPAC. There should be close liaison between the Data Base Committee and the Publications Committee.
4. Funding the creation of the data bases should be approached in a flexible way. In some cases IUPAC could provide the needed funds, for example, from excess of revenue from the publications programme. In other cases the funding may come from national sources. The royalty for IUPAC must be negotiated on a case by case basis.
5. IUPAC should not itself provide on line access to its data bases, but should negotiate with established vendors to provide this service. It should try to achieve the broadest possible distribution.
6. As computerized data bases become widely used, many special problems of chemical nomenclature, terminology, symbols, etc., will arise. The relevant IUPAC Commissions should be urged to address these problems. They should add members with computer expertise as soon as possible.
7. Several possible educational activities should be undertaken, such as an IUPAC summer school on the design of chemical data bases.
8. Several current IUPAC projects were identified as activities for prototype data bases. Committee members were urged to get more details of these projects.

**D. R. Lide, Jr.**

## **Commission VI.2 — Biotechnology:** New Delhi, India, 19 February 1984

### Affiliations

The Division had proposed that the International Organization for Biotechnology and Bioengineering (IOBB) should be affiliated to Commission VI.2 and it was agreed to accord IOBB Observer status. The International Committee for Economic and Applied Microbiology (ICEAM) had approached the Commission with proposals for joint operations. These were to be discussed very soon.

### Existing projects

*Cellulase report.* The final draft had been approved by the Commission and would be prepared for publication in PAC, subject to approval by the Division President.

*Microbiological quality standards:*

*Mycoinsecticides.* The edited draft guidelines had been approved by Commission VI.5 and would be submitted for publication in PAC.

*Bacterial insecticides.* Further revisions were made to the revised draft which was to be sent for comment to other specialists, including a medical expert.

*Microbial biomass from manure.* After discussion of guidelines for analysis of microbial biomass for animal feed from animal manure it was agreed that a paper should be prepared on the history of use of manure in feed, highlighting the problems, and the purpose of the methodology to be proposed. The assistance of ICEAM would be welcomed.

*Hemicellulase assays.* A paper *Measurement of hemicellulase activities: Part 1 — Xylanases* was to be widely circulated for comment and for opinions on priorities for the standardization of other enzyme assays.

### New Projects

Cases for the need for standards for testing sterile air filters, membrane filtration flux, industrial enzymes (e.g. glucose oxidase, glucanglase) and soil innoculants would be established.

**R. C. Righelato**

The Advisory Committee on Chemical Data Bases at the Royal Society, London, U.K. From left to right: Dr. D. P. den Os, Prof. V. A. Koptyug (Chairman), Dr. D. R. Lide, Jr. (Secretary), Dr. T. Yamamoto, Dr. D. Watson, Dr. S. R. Heller

# PROVISIONAL RECOMMENDATIONS

In CI, 1983, No. 5, pp. 42–43, the details of a proposed revised procedure for comment and approval of recommendations on nomenclature and symbols were given. The national/regional centres were listed in CI, 1984, No. 3, pp. 12–13 but we now have some amendments to this list.

**Eastern Europe**
The whole of the heading should be deleted and replaced by '**Hungary**'.

**FRG, Austria and Switzerland**
Replace the name and address of Dr. Fritsche by 'Prof. H. Grünewald, c/o Verlag Chemie GmbH, Postfach 1260/1280, Pappelallee 3, D–6940 Weinheim, Federal Republic of Germany.'

**UK**
Substitute 'Dr. A. McNaught' for 'Dr. I. A. Williams'.

We now have an additional centre

**Argentina**
Dr. J. M. Barnett, Associación Química Argentina, Sánchez de Bustamente 1749, Buenos Aires, Argentina.

## Things happen in chemistry labs

An aspiring young researcher was overjoyed to see his hard work rewarded when he saw an excellent crop of beautiful needle-shaped crystals in the flask which he had left overnight in the refrigerator. This compound had evaded crystallization in his earlier attempt. Not intending to share his find with fellow workers in the laboratory he took the flask immediately to his Professor. When the Professor wanted to examine the crystals on a spatula they started to disappear. After some questioning it emerged that the solvent (benzene) had crystallized in the cool atmosphere of the refrigerator.

# PURE AND APPLIED CHEMISTRY

The contents of recent and forthcoming issues of PAC are, or are expected to be:

| Issue | Pages | Contents | Commission |
|---|---|---|---|
| Vol. 56 (1984)<br>No. 5, May | | *Commission reports* | |
| | 567–594 | Physicochemical quantities and units in clinical chemistry with special emphasis on activities and activity coefficients (*Recommendations 1983*) | VII.2 |
| | 595–624 | Nomenclature and symbolism for amino acids and peptides (*Recommendations 1983*) | JCBN |
| | 625–634 | Molecular characterization of ethylene-propylene block copolymers | IV.2 |
| | 635–644 | Diffusion coefficients of metals in mercury | V.5 |
| | 645–651 | Critical evaluation of analytical methods for the determination of trace elements in various matrices: Part I — Determination of selenium in biological materials and water | V.2 |
| No. 6, June | | *Commission reports* | |
| | 653–674 | Atomic weights of the elements 1983 | II.1 |
| | 675–694 | Isotopic compositions of the elements 1983 | II.1 |
| | 695–768 | Element by element review of their atomic weights | II.1 |
| | 769–778 | Treatment of variable valence in organic nomenclature (λ-convention) (*Recommendations 1983*) | III.1 |
| No. 7, July | 779–938 | Plenary lectures presented at the 12th International Carbohydrate Symposium, Utrecht, Netherlands, 1–7 July 1984 | |
| | | *Commission reports* | |
| | 939–944 | Recommended standards for reporting photochemical data (*Recommendations 1983*) | III.3 |
| | 945–956 | Non-extractable pesticide residues in soils and plants | VI.5 |
| | 957–965 | $\beta_2$-Microglobulin and other urinary proteins as an index of cadmium-nephrotoxicity | VII.4 |

| Issue | Pages | Contents | Commission |
|---|---|---|---|
| No. 9, September | 1153–1300 | Plenary lectures presented at the 10th International Symposium on Photochemistry, Interlaken, Switzerland, 22–27 July 1984 | |
| No. 10, October | 1301–1370 | Invited lectures presented at the 26th Microsymposium on Macromolecules 'Polymers in Medicine and Biology', Prague, Czechoslovakia, 9–12 July 1984 | |
| | 1373–1455 | Invited lectures presented at the 27th Microsymposium on Macromolecules 'Physical Optics of Dynamic Phenomena and Processes in Macromolecular Systems', Prague, Czechoslovakia, 16–19 July 1984 | |
| | | *Commission reports* | |
| | 1457–1475 | Viscoelastic properties of rubber-modified polymeric materials at elevated temperatures | IV.2 |
| | 1477–1498 | Investigation of methods and sources of error in trace element analysis in surface waters using the determination of chromium and mercury as examples | V.2 |
| | 1499–1504 | Quantities and units in clinical chemistry: Nebulizer and flame properties in flame emission and absorption spectrometry (*Provisional*) | VII.2 |
| | 1505–1510 | A basic education and training framework for medical laboratory technicians in clinical chemistry | VII.3 |
| No. 8, August | 967–1068 | Plenary lectures presented at the 14th International Symposium on the Chemistry of Natural Products, Poznań, Poland, 9–14 July 1984 | |
| | | *Commission reports* | |
| | 1069–1094 | Results of a collaborative study on zirconia-based oxygen gauges | II.3 |
| | 1095–1129 | Voltammetry at glassy carbon electrodes | V.5 |
| | 1131–1152 | Improved cost-effective approaches to pesticide residues analysis | VI.5 |

## 150 Years of Toxicology

On 19 October 1834 Joseph-Bienaimé Caventou was appointed to the Chair of Toxicology at the Paris School of Pharmacy, which has since become the Faculty of Pharmaceutical and Biological Sciences of the René Descartes University.

The Faculty of Pharmacy is celebrating this 150th anniversary on 19 October 1984 and, at the same time, the scientific jubilee of Prof. René Truhaut for his outstanding contributions to the teaching of, and research into, toxicology. Old IUPAC people will remember Prof. Truhaut particularly as a President of the Applied Chemistry Division and as Chairman of the Coordinating Committee for Analytical Methods.

# RECENT REPORTS

## Viscoelastic properties of rubber-modified polymeric materials at elevated temperatures

Viscoelastic properties of model systems for commercial rubber-modified polymeric materials such as HIPS and ABS resins were measured at relatively high temperatures in several laboratories. Rubber particles and the matrix polymers (polystyrenes and acrylonitrile–styrene copolymers) were separately prepared and mixed with each other. Viscoelastic parameters and related problems considered in this report are temperature and frequency dependences of storage shear modulus and loss modulus, relaxation spectrum, rubbery plateau modulus, characteristic relaxation time for entanglement couplings in the matrix phase, the second plateau modulus which typically appears in particle–dispersed systems, and the effects of dispersion of particles and composition of copolymers. These subjects were discussed in terms of the rubber particle content, the molecular weight and its distribution of matrix polymers and the relative stiffness of particles to the matrix phase. The dispersion of rubber particles and matching in composition of matrix copolymers and grafted ones on the surface of rubber particles were found to be most important to determine the rheological properties of the composite materials. The aims of the report are to establish the fundamental concepts for viscoelastic and related properties of rubber-modified polymeric materials and to contribute to improvements of processability and performance of the commercial polymeric materials.

This report from Commission IV.2 was published in PAC, Vol. 56, pp. 1457–1475 (1984).

## Investigation of methods and sources of error in trace element analysis in surface waters using the determination of chromium and mercury as examples

Trace element analysis of water samples is often considered to be a relatively easy task as compared to more difficult matrices. With a few examples, however, it can be shown that the analytical discrepancy between laboratories in various countries is too large to be acceptable. Means to overcome the problem are:

i. development of definitive methods,
ii. use of certified reference materials and
iii. frequent intercomparisons — advantages and disadvantages are discussed

An overview of definitive methods in various countries (France, Germany, the Netherlands, Hungary, Poland, Romania, USA, India) shows that in principle most countries agree.

This Commission V.2 report was published in PAC, Vol. 56, pp. 1477–1498 (1984).

## Quantities and units in clinical chemistry: Nebulizer and flame properties in flame emission and absorption spectrometry (*Provisional*)

A classification of quantitative concepts, a unification of nomenclature, and suggestions for the introduction and implementation of recommended units for quantities relating to the nebulizer and flame components of emission and absorption spectrometers are presented. The purpose is to provide users of this form of instrumentation for clinical chemical determinations with a complete, systematic description of the quantities involved in the use of the instruments, so that the data generated from such instruments for patient care purposes is applied correctly. For all quantities listed, the kind of quantity, the symbol for the kind of quantity and a practical unit, the systematic name, the system and the component, and the definition of the quantity are given. Nebulizer quantities defined include the minimum nebulization time, to ensure the analysis provides data of required precision, the efficiency of nebulization and of atomization, and the fractions of a component desolvated, volatilized and atomized are distinguished. Flame properties defined include temperature, observation height, path length and volume, and the times taken for the component to travel through the flame compared to the observation space are characterized. Finally, quantities for gas flow rates through the flame are listed.

This provisional report by Commission VII.2 was published in PAC, Vol. 56, pp. 1499-1504 (1984).

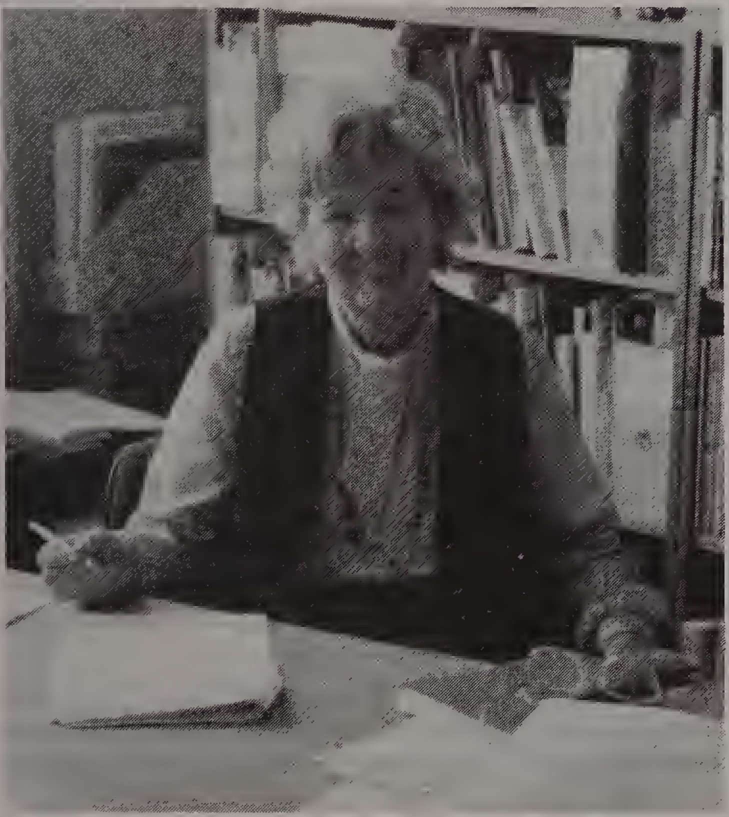
## A basic education and training framework for medical laboratory technicians in clinical chemistry

This report defines the term Technician within the WHO definition of the Medical Laboratory Technician level B. Eleven basic requirements of a training programme at this level are laid down and comment made on their relative importance, taking note of variations in local requirements. The different forms of training, i.e. formal lecture and practical training programmes, in-house training, tutorials and seminars, and the attendance of scientific meetings, are considered with their roles within an integrated training framework, and a recommended syllabus is presented which should be covered within this training framework. Finally, comment is made on how specific training programmes may vary with local requirements, as do the needs of other medical and laboratory personnel. This programme is intended primarily for countries which do not already have a structured training programme for medical laboratory technicians in clinical chemistry.

The report, by Commission VII.3, was published in PAC, Vol. 56, pp. 1505–1510 (1984).

## Let's have another try

In my last editorial, at the end of the first paragraph, I said "... if you think I (or they) have still not got the picture clear enough...". I was not at the time referring to the picture of Mrs. Sheila Haggis on p.10 of that issue. The moonlight effect was, I understand, caused by one of those technical hitches which seem to follow me around (it *would* happen to the only photograph in the issue that I took myself) so, in case you would like to see what she really looks like, let's have another try.



**Mrs. Sheila Haggis, Chief, Scientific Education Section, UNESCO**

## International Committee on the Science of Photography (ICSP)

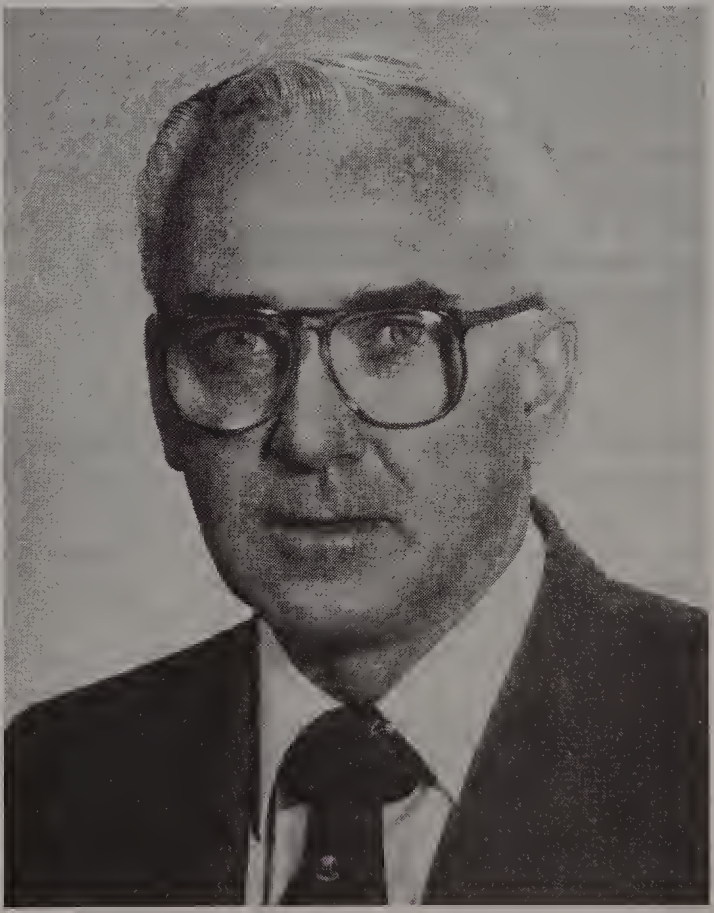
We have recently heard, with regret, of the death of Prof. W. F. Berg, President of ICSP. We understand that it was largely due to Prof. Berg's initiative that ICSP became, in 1977, an Associated Organization of IUPAC.

## A Quotable Quote Requoted

In the IUFoST *Newsletter*, New Series No. 9, December 1983, appeared the Quotable Quote —

> Scientific Unions have rather negligible budgets compared with governmental and other international agencies and do few things that could not be done by other organizations. Yet through the generations, they have persisted and their prestige has prospered. This is because the international scientific community still recognizes that the authority of its world is its free international conscience and seems determined to safeguard it.

These remarks were attributed to Prof. Larkin Kerwin, Secretary General of IUPAP, who has confirmed that they were indeed his and were made in the context of a talk on the nature of international science.



**Prof. L. Kerwin, Secretary General, IUPAP**

# IUPAC CONFERENCES

Additional information from address in parentheses

## 1984

### AUTOMATION

October 15–18. 2nd International Congress on Automation in the Clinical Laboratory. Barcelona, Spain.
(The Secretary of the Second Congress, Dr. R. Galimay, Apartado de Correos 543, Barcelona, Spain.)

### COLLABORATIVE CHEMICAL ANALYSIS

October 25–27. 2nd International Symposium on the Harmonization of Collaborative Analytical Studies. Washington, DC, USA.
(Dr. L. E. Coles, Mid-Glamorgan Public Health Laboratory, The Parade, Cardiff, CF2 3UJ, UK.)

## 1985

### POLYMER ANALYSIS

February 11–14. POLYMER 85: Characterization and Analysis of Polymers. Melbourne, Australia.
(Dr. J. H. O'Donnell, Polymer & Radiation Group, Department of Chemistry, University of Queensland, Brisbane 4067, Australia.)

### HYDROGEN IN METALS

March 26–29. 5th International Symposium on Hydrogen in Metals. Belfast, UK.
(Dr. F. A. Lewis, Department of Chemistry, David Keir Building, The Queen's University of Belfast, Belfast, BT9 5AG, Northern Ireland, UK.)

### ANALYTICAL CHEMISTRY

April 15–19. 2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Pretoria, RSA.
(Dr. A. Strasheim, Department of Chemistry, University of Pretoria, Pretoria 0002, Republic of South Africa).

### NONCRYSTALLINE ORDER IN POLYMERS

May 27–30. International Symposium on Noncrystalline Order in Polymers. Naples, Italy.
(Prof. P. Corradini, Dipartimento di Napoli, Universita di Napoli, Via Mezzocannone 4, I-80134 Napoli, Italy.)

### BIOORGANIC CHEMISTRY

June. 1st International Symposium on Bioorganic Chemistry. New York City, NY, USA.
(Prof. R. Breslow, Department of Chemistry, Columbia University, New York, NY 10027, USA.)

### NON-CRYSTALLINE SOLIDS

June 3–6. International Conference on the Theory of the Structures of Non-crystalline Solids. Bloomfield Hills, Michigan, USA.
(Prof. H. F. Schaefer III, Department of Chemistry, University of California, Berkeley, California 94720, USA.)

### SURFACE AND COLLOID SCIENCE

June 24–28. 5th International Conference on Surface and Colloid Science, Potsdam, NY, USA.
(Prof. E. Matijević, Institute of Colloid and Surface Science, Clarkson University, Potsdam, NY 13676, USA.)

### PLASMA CHEMISTRY

July 1–5. 7th International Symposium on Plasma Chemistry. Eindhoven, Netherlands.
(Prof. D. C. Schram, Department of Physics, Technische Hogeschool Eindhoven, P.O. Box 513, NL–5600 MB Eindhoven, Netherlands.)

### POLYMER COMPOSITES

July 8–11. 28th Microsymposium on Macromolecules: Polymer Composites. Prague, Czechoslovakia.
(Dr. P. Cefelin, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 1888 Petriny, Prague 6, Czechoslovakia.)

### ORGANOMETALLIC CHEMISTRY

July 12–15. 3rd International Symposium on Organometallic Chemistry directed toward Organic Synthesis. Kyoto, Japan.
(Prof. H. Nozaki, Department of Industrial Chemistry, Kyoto University (Kogaku-Bu), Yoshida, Kyoto, 606 Japan.)

### AROMATIC COMPOUNDS

July 15–19. 5th International Symposium on Novel Aromatic Compounds. St. Andrews, UK.
(Dr. P. J. Garratt, Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, UK.)

### INTERACTIONS IN SOLUTION

July 15–19. 7th International Symposium on Solute-Solute-Solvent Interactions. Reading, UK.
(Dr. A. D. Pethybridge, Department of Chemistry, The University of Reading, Whiteknights, Reading, Berkshire, RG6 2AD, UK.)

### MYCOTOXINS AND PHYCOTOXINS

July 22–25. 6th International Symposium on Mycotoxins and Phycotoxins. Pretoria, RSA.
(Dr. P. S. Steyn, National Chemical Research Laboratory, Council for Scientific and Industrial Research, POB 395, Pretoria 0001, Republic of South Africa.)

### HETEROCYCLIC CHEMISTRY

August 11–16. 10th International Congress of Heterocyclic Chemistry. Waterloo, Ontario, Canada.
(Prof. V. Snieckus, The Guelph-Waterloo Centre for Graduate Work in Chemistry, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.)

### CATIONIC POLYMERIZATION

August 12–15. 7th International Symposium on Cationic Polymerization and Related Processes. Jena, GDR.
(Prof. G. Heublein, Sektion Chemie, Friedrich-Schiller-Universität, DDR–6900 Jena, German Democratic Republic.)

### MACROMOLECULES

August 18–23. 30th International Symposium on Macromolecules. The Hague, Netherlands.
(Dr. J. A. M. Smit, Gorlaeus Laboratories, University of Leiden, Department of Chemistry, P.O. Box 9502, NL-2300 RA Leiden, Netherlands.)

### THERMAL ANALYSIS

August 19–23. 8th International Conference on Thermal Analysis. Bratislava, Czechoslovakia.
(Dr. P. K. Gallagher, Rm 6D-311 Bell Laboratories, Murray Hill, New Jersey 07974, USA.)

### CHEMICAL EDUCATION

August 23–28. 8th International Conference on Chemical Education: Widening the Scope of Chemistry. Tokyo, Japan.
(Prof. J. T. Shimozawa, Secretary General of 8–ICCE, c/o The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

### MATHEMATICS AND CHEMISTRY

September 2–5. International Symposium on Applications of Mathematical Concepts to Chemistry. Dubrovnik, Croatia, Yugoslavia.
(Prof. N. Trinajstić, Ruder Bošković Institute, PO Box 1016, Bijenička 54, YU-41001 Zagreb, Croatia, Yugoslavia.)

### MASS SPECTROMETRY

September 8–13. 10th International Symposium on Mass Spectrometry. Swansea, UK.
(Prof. J. H. Beynon, Royal Society Research Unit, University College of Swansea, Swansea SA2 8PP, UK.)

### ORGANOMETALLIC CHEMISTRY

September 8–13. 12th International Conference on Organometallic Chemistry. Vienna, Austria.
(Prof. K. Schlögl, Institut für Organische Chemie der Universität, Währinger Strasse 38, A–1090 Wien, Austria.)

### IUPAC CONGRESS

September 9–13. 30th International Congress of Pure and Applied Chemistry. Manchester, UK.
(The Royal Society of Chemistry, Burlington House, London, W1V 0BN, UK.)

### SPECTROSCOPY

September 15–21. 24th Colloquium Spectroscopicum Internationale (CSI XXIV). Garmisch-Partenkirchen, FRG.
(Dr. W. Fritsche, Gesellschaft Deutscher Chemiker, Carl Bosch-Haus, Postfach 900440, Varrentrappstrasse 40–42, D–6000 Frankfurt/Main 90, Federal Republic of Germany.)

### CHEMICAL RESOURCES OF THE OCEAN

September 22–28. Chemical Resources of the Global Oceans — CHEMRAWN IV. Massachusetts, USA.
(J. R. Moore, Director, Marine Science Institute, University of Texas, Austin, TX 78712, USA.)

## 1986

### PESTICIDE CHEMISTRY

August 10–17. 6th International Pesticide Chemistry Congress. Ottawa, Canada.
(Dr. H. V. Morley, London Research Station, Agriculture Canada, University Sub-Post Office, London, Ontario, Canada.)

### NATURAL PRODUCTS

August 17–23. 15th International Symposium on the Chemistry of Natural Products. The Hague, Netherlands.
(Prof. U. K. Pandit, Laboratorium voor Organische Scheikunde, Universiteit van Amsterdam, Nieuwe Achtergracht 129, NL-1018 WS Amsterdam, Netherlands.)

### PHYSICAL ORGANIC CHEMISTRY

August 24–29. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan.
(Prof. M. Oki, Department of Chemistry, Faculty of Science, University of Tokyo, Tokyo 113, Japan.)

# REVISIONS TO IUPAC HANDBOOK

## CI, 1984, Supplement

Additions and amendments to the alphabetical list of members between 6 June and 23 July 1984 are given below.
Additions, new entries, are marked with an asterisk.
Amendments are shown by # at the beginning of the line in which the revision occurs.

### COMMISSION ON CHEMICAL KINETICS (I.4)
(Established 1983)

*Titular Members

Prof. K. J. Laidler (1983-1987)
  Chairman
Prof. A. Bard (1983-1987)
Prof. F. C. De Schryver (1983-1987)
Dr. C. G. Eastmond (1983-1987)
Prof. W. C. Purdy (1983-1987)
Prof. J. P. Simons (1983-1987)
Prof. J. Villermaux (1983-1987)

*BARD, Prof. A., Department of Chemistry, University of Texas at Austin,
Austin, Texas 78712, USA
(TEL: +1 (512) 471 3761) (16)
Titular Member I.4 (1983-1987)

*JEMMALI, Prof. M., Department of Biochemistry, Faculté Médecine,
Sousse, Tunisia (32)
Associate Member VI.1 (1983-1987)

*KEMPE, Prof. G., Technische Hochschule "Carl Schorlemmer" Leuna-Merseburg,
Geusaer Strasse, DDR-4200 Merseburg 6, German Democratic Republic
(TELEX: 471320 THLM DD) (11)
National Representative CTC (1984-1985)

*LAIDLER, Prof. K. J., Department of Chemistry, University of Ottawa,
Ottawa, Ontario K1N 9B4, Canada
(TEL: +1 (613) 231 4227. TELEX: 0533338 CA) (16)
Titular Member (Chairman) I.4 (1983-1987)

*SIMONS, Prof. J. P., Department of Chemistry, University of Nottingham,
University Park, Nottingham NG7 2RD, UK (16)
Titular Member I.4 (1983-1987)

*VILLERMAUX, Prof. J., Laboratoire des Sciences du Génie Chimique,
École Nationale Supérieure des Industries Chimiques,
1 rue Grandville, F-54042 Nancy, France
(TEL: +33 (8) 336 66 23. TELEX: 960431 ADNANCY F) (16)
Titular Member I.4 (1983-1987)

Amendments:

AHLUWALIA, Prof. J. C., Department of Chemistry, Indian Institute of Technology,
#Hauz Khas, New Delhi-110016, India
#(TEL: +91 (11) 666979, 653576) (16)

#AMBRUS, Dr. A., c/o UNDP, POB 5, Kabul, Afghanistan (33)

BEEK, Prof. W. J., Unilever Research Laboratorium, PO Box 114,
3130 AC Vlaardingen, Netherlands
#(TEL: +31 (10) 605075. TELEX: 23261 URL VL NL) (10)

DE SCHRYVER, Prof. F. C., Afdeling Organische Scheikunde, Katholieke Universiteit
te Leuven, Celestijnenlaan 200 F, B-3030 Heverlee, Belgium
#(TEL: +32 (16) 20 0656. TELEX: 23674 KULEUV B) (5, 16, 22)

EASTMOND, Dr. G. C., Donnan Laboratories, Department of Inorganic, Physical
and Industrial Chemistry, University of Liverpool, POB 147, Grove Street,
Liverpool L69 3BX, UK
#(TEL: +44 (51) 709 6022. TELEX: 627095 G) (16, 24, 26)

FLEISSNER, Dr. M., Hoechst AG, Kunststoff Forschung H, Postfach 800320,
D-6230 Frankfurt/Main 80, Federal Republic of Germany
#(TEL: +49 (611) 3053422. TELEX: 41234-0 HOEAG D) (24)

#GILLES, Prof. P. W., Department of Chemistry, 224 Malott Hall, University of Kansas,
Lawrence, Kansas 66045, USA
(TEL: +1 (913) 864 3829. TELEX: 910 749 6572) (20)

GORBACH, Dr. S., Hoechst AG, Analytisches Laboratorium, Postfach 800320,
D-6230 Frankfurt/Main 80, Federal Republic of Germany
#(TEL: +49 (611) 3056012. TELEX: 41234-0 HOEAG D) (32, 33)

GURVICH, Prof. L. V., Institute for High Temperatures, Academy of Sciences of USSR,
Korovinskoye Road, SU-127412 Moscow, USSR
#(TEL: +7 (095) 485 9572. TELEX: 411959 IVTAN SU) (20)

#HAUL, Prof. R. A. W., Institut für Physikalische Chemie und Elektrochemie der
#Universität Hannover, Callinstrasse 46, D-3000 Hannover, Federal Republic of Germany
#(TEL: +49 (511) 762-2250/2350. TELEX: 923868 TU HAN D) (18)

#JANCSÓ, Dr. G., Magyar Tudományos Akadémia, Központi Fizikai
#Kutató Intézet, POB 49, H-1525 Budapest, Hungary (30)

KEARNEY, Dr. P. C., Building 050, BARC-W, Pesticide Degradation Laboratory,
Agricultural Environment Quality Institute, US Department of Agriculture,
Beltsville, Maryland 20705, USA
#(TEL: +1 (301) 344 3533) (32, 34)

#KLEIN, Prof. J., Gesellschaft für Biotechnologische Forschung mbH,
#Mascheroder Weg 1, D-3300 Braunschweig, Federal Republic of Germany
#(TEL: +49 (531) 7008-218/219) (10)

KLEIN, Dr. W., Fraunhofer-Institut für Toxikologie und Aerosolforschung,
Institutsteil Grafschaft, D-5948 Schmallenberg, Federal Republic of Germany
#(TEL: +49 (2972) 494-96. TELEX: 841520 D) (13, 33)

LÜCK, Dr. E., Hoechst AG, Forschung und Entwicklung Lebensmitteltechnik, D 729,
Postfach 800320, D-6230 Frankfurt/Main 80, Federal Republic of Germany
#(TEL: +49 (611) 3055542. TELEX: 41234-0 HOEAG D) (32)

McLACHLAN, Dr. D. R. C., Department of Physiology, University of Toronto,
#Toronto, Ontario M5S 1A8, Canada
(TEL: +1 (416) 978 2011) (38)

MASSON, Dr. MARY, Department of Chemistry, University of Aberdeen,
Old Aberdeen AB9 2UE, UK
#(TEL: +44 (224) 40241. TELEX: 73458 UNILIB ABDN G) (30)

MEDVEDEV, Dr. V. A., Institute for High Temperatures, Academy of Sciences of USSR,
Korovinskoye Road, SU-127412 Moscow, USSR
#(TEL: +7 (095) 232 4205. TELEX: 411959 IVTAN SU) (15)

MODENA, Prof. G., Istituto di Chimica Organica dell'Università, Via Marzolo 1,
#I-35131 Padova, Italy
(TEL: +39 (49) 656678. TELEX: 430176 UNIPADUA I) (10, 21)

#OTTO, Dr. S., BASF Aktiengesellschaft, Landwirtschaftliche Versuchsstation,
Postfach 220, D-6703 Limburgerhof, Federal Republic of Germany
(TEL: +49 (6236) 68201. TELEX: 464600 BASF D) (33)

PURDY, Prof. W. C., Department of Chemistry, McGill University,
801 Sherbrooke Street West, Montreal, Québec H3A 2K6, Canada
#(TEL: +1 (514) 392 4437) (11, 16, 29, 36)

RANGARAJAN, Prof. S. K., Department of Inorganic and Physical Chemistry,
#Indian Institute of Science, Bangalore-560012, India
#(TEL: +91 (812) 34411. TELEX: 0845-8349 IISC IN) (16)

RAO, Prof. C. N. R., Solid State and Structural Chemistry Unit,
#Indian Institute of Science, Bangalore-560012, India
#(TEL: +91 (812) 34411. TELEX: 0845-8349 IISC IN) (v, 10, 13)

STRASHEIM, Dr. A., Chemistry Department, University of Pretoria, Pretoria 0002,
Republic of South Africa
#(TEL: +27 (12) 436051. TELEX: 3-21312 SA) (28)

STRAUS, Prof. B., Zavod za Medicinsku Biokemiju, Farmaceutsko-Biokemijski Fakultet,
#Sveuciliste u Zagrebu, Domagojeva 2, YU-41000 Zagreb, Yugoslavia
(TEL: +38 (41) 4146) (36)

SVEHLA, Dr. G., Department of Chemistry, David Keir Building, Queen's University
of Belfast, Stranmillis Road, Belfast BT9 5AG, Northern Ireland, UK
#(TEL: +0044 (0232) 661111. TELEX: 74487 QUBADM G) (28)

VERNERKAR, Prof. R., Department of Inorganic and Physical Chemistry,
#Indian Institute of Science, Bangalore-560012, India
#(TEL: +91 (812) 34411. TELEX: 0845-8349 IISC IN) (20)

Deletions:

Dr. H. Egan (deceased) [p. 10, Secretary CHEMRAWN Committee; p. 11, CI Editorial Board; p. 12, Associate Member IDCNS; p. 32, Coopted Member Division VI.]

Prof. G. F. Kirkbright (deceased) [p. 28, Associate Member V.4]

Prof. H. Bremer (resigned) [p. 11, National Representative CTC]

---

## Science Education through Self-reliance

This iv + 21-page booklet is published by The Commonwealth Foundation (Marlborough House, Pall Mall, London SW1Y 5HU, UK) and is an account by Prof. K. V. Sane of the University of Delhi of the IUPAC CTC–UNESCO project on low-cost equipment for chemical education and of his tour of Bangladesh, Malaysia, Papua New Guinea, Singapore and Sri Lanka as the first Senior Visiting Practitioner of the Foundation (see CI, 1983, No. 5, p. 51).

The final section of the booklet, entitled "Model and Proposal: A plan for propagating self-reliance in science education through international cooperation", describes some useful developments arising from the success of the tour, the basic model developed from the project and proposals for future extension of this model to cover other equipment and other scientific fields.

An account of the project itself is given elsewhere in this issue (pp. 37–39) in a paper by Prof. Sane.

## The Patterson–Crane Award

The Austin M. Patterson–E. J. Crane Award, sponsored by the Columbus and Dayton Sections of the American Chemical Society, is international in scope and is given for contributions in the field of chemical literature, especially in the documentation of chemistry, chemical information storage and retrieval, and implementing and managing chemical information services. Nominations for the 1985 Award are invited, to be submitted by 31 January 1985. Further information may be obtained from Dr. Eugene F. Jendrek, Monsanto Research Corporation, MRC-Mound, Miamisburg, Ohio 45342, USA.

## Chemistry International

is the news magazine of the

# INTERNATIONAL UNION of PURE and APPLIED CHEMISTRY (IUPAC)

---

*President:* W. G. SCHNEIDER *(Canada)*
*Vice-President:* C. N. R. RAO *(India)*
*Secretary-General:* T. S. WEST *(UK)*
*Treasurer:* A. BJÖRKMAN *(Denmark)*

**IUPAC Secretariat**
Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)

Telephone: + 44 (865) 717744
Telex: 83147 attn. IUPAC    Telegrams: IUPAC OXFORD

---

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:
to promote continuing co-operation among the chemists of the member countries;
to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
to co-operate with other international organizations which deal with topics of a chemical nature;
to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 45 countries, each represented by a national organization, such as an academy of science or research council.

---

### NATIONAL MEMBER ORGANIZATIONS

Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
Asociación Química Argentina **(Argentina)**
Australian Academy of Science **(Australia)**
Verein Österreichischer Chemiker **(Austria)**
Comité National Belge de Chimie **(Belgium)**
Associacão Brasileira de Química **(Brazil)**
Bulgarian Academy of Sciences **(Bulgaria)**
National Research Council of Canada **(Canada)**
Chinese Chemical Society, and Chemical Society located in Taipei, China **(China)**
Ministerio de Minas y Petróleos **(Colombia)**
Academia de Ciencias de la República de Cuba **(Cuba)**
Czechoslovak National Committee of Chemistry **(Czechoslovakia)**
Det Kongelige Danske Videnskabernes Selskab **(Denmark)**
Suomen Kemian Seura **(Finland)**
Comité National Français de la Chimie **(France)**
Deutscher Zentralausschuss für Chemie **(Federal Republic of Germany)**
Akademie der Wissenschaften der DDR **(German Democratic Republic)**
Association of Greek Chemists **(Greece)**
Hungarian Academy of Sciences **(Hungary)**
Indian National Science Academy **(India)**
Iraqi Chemical Society **(Iraq)**
Royal Irish Academy **(Ireland)**
Israel Academy of Sciences and Humanities **(Israel)**
Consiglio Nazionale delle Ricerche **(Italy)**
Science Council of Japan **(Japan)**
Malaysian Institute of Chemistry **(Malaysia)**
Koninklijke Nederlandse Chemische Vereniging **(Netherlands)**
Royal Sociey of New Zealand **(New Zealand)**
Norsk Kjemisk Selskap **(Norway)**
Sociedad Química del Perú **(Peru)**
Polska Akademia Nauk **(Poland)**
Sociedade Portuguesa de Química **(Portugal)**
Korean Chemical Society **(Republic of Korea)**
Council for Scientific and Industrial Research **(Republic of South Africa)**
Academia Republicii Socialiste România **(Romania)**
Consejo Superior de Investigaciones Científicas **(Spain)**
Svenska Nationalkommittén för Kemi **(Sweden)**
Schweizerisches Komitee für Chemie **(Switzerland)**
Supreme Council of Sciences **(Syrian Arab Republic)**
Türkiye Kimya Dearneği **(Turkey)**
Academy of Sciences of USSR **(USSR)**
Royal Society **(United Kingdom)**
National Research Council, National Academy of Sciences **(USA)**
Instituto Venezolano de Investigaciones Científicas **(Venezuela)**
Unija Hemijskih Društava Jugoslavije **(Yugoslavia)**

# Chemistry International

IUPAC

## *Contents* *1984, No. 5 (October)*

1 Editorial
2 Wrong again
3 The Secretary General's column
6 IUPAC people
7 Division Presidents' Reports to the Bureau
17 IUPAC-sponsored Conferences
18 Commission V. 6
20 The role of the chemical industry in development
29 CHEMRAWN III
32 Chemists have wide job opportunities
35 Division Presidents
37 Low-cost equipment for chemical education
39 IUFOST symposium; International Union of Crysteelography
40 Other people's publications
41 CNC-IUPAC
42 Summary minutes of Committee and Commission meetings
43 Provisional Recommendations *(amendments to national/regional centres)*; Things happen in chemistry labs
44 *Pure and Applied Chemistry*
45 150 Years of toxicology
46 Recent reports
47 Another try; International Committee on the Science of Photography (ICSP); A quotable quote
48 IUPAC Conferences
50 Revisions to *IUPAC Handbook*
52 *Science Education through Self-reliance;* The Patterson–Crane Award

ISSN 0

Printed by The Nuffield Press Limited, Oxford.

# Chemistry International

he news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

1984, No.6 (December)

Pergamon Press

19 DEC 1984

# CHEMISTRY INTERNATIONAL

## The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Roger Fennell
PRODUCTION EDITOR: Richard J. Palmer

## EDITORIAL ADVISORY BOARD

*Chairman:* T. S. WEST *Secretary-General*
R. DEGAIN *Committee on Chemistry and Industry*
D. P. DEN OS *Committee on Publications*
L. PAOLONI *Committee on Teaching of Chemistry*
K. L. LOENING *Interdivisional Committee on Nomenclature and Symbols*
K. S. W. SING *Division I*
E. FLUCK *Division II*
N. J. LEONARD *Division III*
M. MANDEL *Division IV*
G. DEN BOEF *Division V*
L. E. COLES *Division VI*
D. B. TONKS *Division VII*
*Secretary:* R. W. FENNELL *Editor*

## SUBSCRIPTIONS

Six issues of *Chemistry International* will be published in 1985. Annual subscription rate including postage is US$20 for individuals, and US$40 for libraries. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, UK.

## REPRODUCTION OF ARTICLES

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*. Permission to reproduce articles will normally be granted at no cost to non-profit making bodies (such as National Adhering or Associated Organizations of IUPAC, National Chemical Societies, or International Scientific Unions). Permission for commercial publishers will normally be conditional upon publication of an advertisement for IUPAC publications. In all cases, please contact the IUPAC Secretariat for clearance.

**Front cover:** Academician Yu. Ovchinnikov at the opening of the XIII Mendeleev Congress, dedicated to the 150th Anniversary of D. I. Mendeleev.

Pergamon Press

Oxford New York Toronto Sydney Paris Frankfurt

© 1984 International Union of Pure and Applied Chemistry

# EDITORIAL

Opinions expressed here are those of the author, and do not necessarily reflect the views or policy of IUPAC

May I refer to the first paragraph in the editorial of the October issue of CI. As anticipated there, the Bureau has met, the official publisher to the Union has been chosen, sufficient funds are available to launch the Affiliate Membership Scheme — but you have not yet got a new Editor. The sighs of relief will have to be temporarily postponed.

The name of Mendeleev must be familiar to everybody who has studied chemistry — even if they never got further than their first school examination in the subject. To celebrate the 150th anniversary of his birth we have two articles in this issue: the first, by Prof. Z. E. Samoylova (pp. 9–12) is focused on the anniversary meeting held in Leningrad in May this year whilst the second, by Dr. N. E. Holden (pp. 18–31) is an historical paper on the development of the Periodic Table and Mendeleev's part in this development. Possibly just as familiar to analytical chemists is the name of Kolthoff — his 90th birthday is also recorded.

The Secretary General has periods when we work him hard for copy for CI — and this is one of those periods. We have another Secretary General's column (pp. 3–8) to keep you fully conversant with the outcome of the Bureau meeting held in Oxford in September. It was perhaps unfortunate for him that he got back from attending, as IUPAC representative, the ICSU General Assembly in Canada just in time to be able to compose and submit a report on this meeting by the final copy date for this issue. And when I say "just in time" this is literally true. Last-minute alterations to the text had to be telephoned from Aberdeen to Oxford in order to be inserted — the manuscript was taken to Pergamon the day it arrived on my desk! We do try to keep you up to date. Secretaries of IUPAC Committees and Commissions are also keeping the rest of us informed by sending in summary minutes of the meetings of their respective bodies. Secretaries, please keep at it — somebody else really is interested in what you are doing.

Also included in this issue is a short review by Prof. Fluck on the work of the Inorganic Chemistry Division, and a guide to sources of IUPAC terminology, compiled by Prof. Gold for IDCNS. The latter is not only a useful compilation but also serves to illustrate the amount of effort expended by IUPAC bodies in trying to persuade the chemical community to "get the words right".

This issue's diversification comes in the form of two articles concerning the Federation of European Chemical Societies (FECS) — one a report on the General Assembly in London in June by Dr. Williams and the other a paper by one of the FECS Working Parties, on Professional Affairs, on the possible clash of interests of professional bodies and trade unions. This, although not at the moment of world-wide concern, I found to be interesting. For example, I did not know when I was a 'working' chemist that I was defined by the ILO. What about you? However, I don't think I quite fit the definition now.

As I said earlier, the Union has chosen its official publisher for the next 4 years and it is not Pergamon Press. This then is the last issue that will be processed by the team with whom I have worked for the last 2 years. We have had our difficulties and differences but it has been a real pleasure to work with them. I have, therefore, taken the liberty of introducing some of them to you — as a parting, friendly, gesture to the people behind the scenes.

Finally, just in case you get this before the end of the year, may I wish you the compliments of the season and a very successful 1985 — a year which, of course, includes another General Assembly.

---

# Official Publisher to the Union

As from 1 January 1985, Blackwell Scientific Publications Ltd., Osney Mead, Oxford, OX2 0EL, UK, has been appointed the official publisher to the Union for the next four years. They will be responsible for all IUPAC publications except for the Solubility Data Series, which will continue to be published by Pergamon Press Ltd.

---

**Another 1984 anniversary. Members of the Secretariat steal a brief moment to celebrate Ann's . . th birthday. From left to right: Mr. P. D. Gujral, Dr. M. Williams, Mr. R. W. Fennell, Miss A. Troughton, Mrs. V. Gomez, Mrs. U. Inglis, Mrs. J. Preston**

# THE SECRETARY GENERAL'S COLUMN

The Bureau of the Union held its 49th meeting on 16–17 September in Oxford at St Anne's College. The Bureau comprises the four Officers and the immediate Past-President of the Union, together with the Presidents of the seven scientific Divisions and "not less than ten other members elected by the Council" at a General Assembly of the Union. It normally meets once each year, including odd-numbered years when all IUPAC bodies meet together during the General Assembly. It is empowered to act on behalf of the Council during intervals between Council meetings except on matters specifically excluded from its delegated authority, e.g. it may not elect Officers of the Union nor admit or remove Members of the Union. At St Anne's College, the 49th Bureau was a busy and productive meeting that took several decisions which will affect the future course of IUPAC. It also formulated policies and suggested courses of action for decision by the Council at the 33rd General Assembly in Lyon, 30 August–7 September 1985.

## Progress of individual affiliation of chemists to IUPAC

### *The chosen few?*

IUPAC is a corporate body. Its Members (National Adhering Organizations, NAOs) are the National Academies of Science, National Research Councils or, sometimes, National Chemical Societies, which represent the interests of chemists and make IUPAC's existence, and most of its activities, possible by payment of annual subscriptions. Within the Divisions, Commissions, and other Committees of the Union, about 1400 chemists are active in IUPAC's affairs. This core of chemists constitutes an extremely small fraction of the total number of chemists within the forty-five member countries of IUPAC and, of course, even more so of the global community of chemists. Furthermore, these 1400 are involved only by invitation from within the Union. Several years ago an initiative was taken by the Council to seek a way to end this "exclusive club" image, to maximize the possibility for chemists to interact with their Union and to allow them to become associated with it personally of their own volition.

### *Astronomical solution*

The Union was aware, for example, that the International Union of Astronomy (IAU) functions with personal members. Although there are very few astronomers relative to the number of chemists, every astronomer has the possibility of being an individual member of IAU via his or her NAO (to IAU). One consequence of this is that all astronomers of international or national standing are individual members of IAU. Thus, whilst there are only 1400 chemists involved with IUPAC, there are at present 5200 astronomers in IAU and that number is likely to increase to 6000 next year. Clearly such a solution is not possible for chemists, because they are too numerous: NAOs (to IUPAC) could not possibly assume the financial burden that would be involved and, additionally, the organization of a central secretariat would be complex and costly.

### *IUPAC Lyngby decision*

However, a Scheme was evolved and approved by the IUPAC Council at the 1983 General Assembly in Lyngby which would allow chemists to become voluntarily associated with IUPAC as Affiliate Members through their own Academies of Science or, probably in many cases according to national decision, via their National Chemical Societies (see Fig. 1).

In effect, chemists in IUPAC member countries who wanted to become IUPAC Affiliate Members would have to do so through their National Academy or National Chemical Societies as approved by their NAO. They would in the first place have to be members of the organization, i.e. Academy or Chemical Society, and would pay their dues to it. IUPAC would distribute copies of *Chemistry International* (CI) to Affiliate Members via the Academy/Chemical Society and would charge the latter only enough money to cover its costs. Naturally the Academy/Chemical Society would have to recover its own distribution/handling costs. These two cost components would constitute the dues for Affiliate Membership.

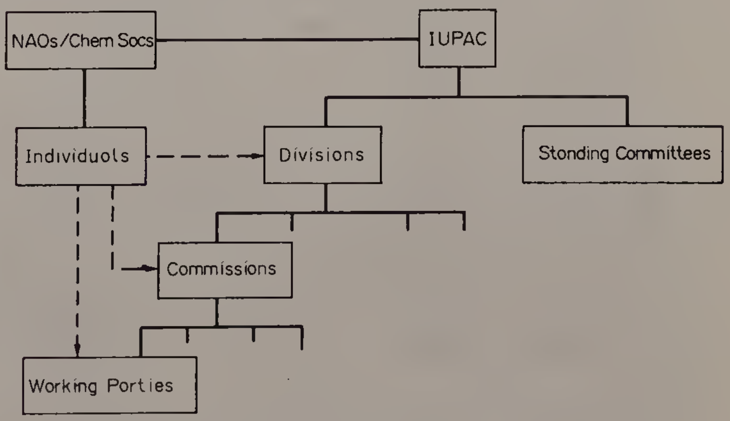


**Fig. 1. Individual Affiliate Member scenario**

Individuals would become affiliated to IUPAC via their Academy (or Chemical Society, according to the decision of each NAO). Thereafter, they may become associated with the Divisions, Commissions, and Working Groups of the Union as shown in the diagram via the broken lines. Comments on scientific matters could be made directly to Division Secretaries or Commission Secretaries. Affiliate Members would be visible as potential members of Commissions and Working Groups through a register of Affiliates. They would receive six copies of CI per year, through which the Divisions and Commissions would keep them informed of their current work and future plans.

In a country not belonging to IUPAC the Union would seek to operate the Scheme via a National Chemical Society of that country. In countries not possessing such an organization, chemists would be able to join individually through the IUPAC Secretariat.

### *Oxford problem*

In the most recent Secretary General's Column (CI, 1984, No. 5, pp. 3–6) I reported that the Officers had accumulated promises of US$23 000 from ICSU and our NAOs as seed money to set the Scheme going, and that the Bureau would be asked to allow the recruitment of the necessary staff, in 1985, to start consultations with the NAOs and/or National Chemical Societies in member countries with a view to starting recruitment of Affiliates for 1986.

### *Bureau breakthrough*

The Bureau gave its blessing to this proposal and we are in process of recruiting an IUPAC Information Officer/Affiliate Affairs Secretary. He will be responsible for conducting correspondence and setting the Scheme up during 1985, with enrolment of Affiliate Members to begin with effect from January 1986. The funds now available should be sufficient to enable the Scheme to operate at no cost to the Union in 1986. Additional funding is expected to become available from outside the Union to allow it to be operated similarly for a second year in 1987 and, with help from UNESCO, even to allow enrolment of Affiliate Members in developing countries at a nominal cost of US$1 each per year. Meanwhile, the Bureau has authorized the Officers (Executive Committee) to take decisions in April 1985, as necessary, with regard to prosecution of the Scheme in 1987.

The Bureau's decision to set the wheels in motion to launch the Affiliate Membership Scheme in 1986, and to use its best endeavours to give the fledgling Scheme a chance to fly in 1987, is in the best tradition of chemical experimentation. The doors of the Union will be opened wide to all chemists in early 1986. The Scheme is designed to become self-financing and is thought to be sufficiently flexible to meet the needs of most countries with respect to costs and organization. If insufficient chemists become affiliated to enable the Scheme to become self-financing it will, of course, have to be withdrawn. But at least IUPAC will have performed the experiment and offered the opportunity to chemists the world over.

**All eyes on the President. From left to right: Prof. Y. Jeannin, Prof. H.Gg. Wagner, Dr. A. J. Arvía**

## New dues structure — Vote allocation

As a consequence of decisions taken at the Council meeting in Lyngby, the Bureau has to report back, at Lyon in 1985, with proposals for allocating votes according to the new dues structure. Meanwhile the number of votes allocated to each member country must stay the same until the end of the Lyon General Assembly. In my previous Column I outlined the proposals that were under discussion by the Officers. These were finalized, adopted by the Bureau at Oxford, and have been circulated to NAOs. However, those chemists who are interested in the decision-making procedures of the Union may like to learn what is to be proposed to the Council in September 1985.

The number of "votes" or delegates assigned to a member country (NAO) was hitherto based on its "category of membership". As I explained previously, "categories" are to be abolished and the number of votes/delegates now has to be related to the dues as calculated by the mathematical formula adopted at Lyngby. The Council will, therefore, be invited to approve the following principles:

1. No NAO will be assigned a smaller number of votes than at Lyngby;
2. Any change in the number of votes for an NAO should be marginal compared to the number of votes assigned to it at Lyngby;

3. In future NAOs with the lowest number of votes (1) will be eligible to vote on non-scientific (i.e. policy) matters.

Based on these principles, the relationship between the number of votes and the NAO subscription (derived from the mathematical formula involving chemical turnover) would be as shown in Table 1, according to the 1984 dues. Table 2 outlines the comparative situation now proposed and that obtaining at Lyngby in 1983.

**Table 1. Proposed relationship between votes and national subscription**

| 1984 NAO Subscription (US$ × $10^3$) | Votes |
|---|---|
| ⩾ 20 | 6 |
| 9.5 – 19.9 | 5 |
| 3.0 – 9.4 | 4 |
| 2.5 – 2.9 | 3 |
| 1.1 – 2.4 | 2 |
| 0.6 – 1.0 | 1 |

In Table 2, band II shows those member countries which would be promoted to the new 5-vote/delegate level from 4 votes in 1983. Band IV similarly shows those promoted to 3 votes from 2 votes. Member countries in band VI, whilst still holding 1 vote, would be able to vote on all matters in future. At Lyon, NAOs will continue to have the same number of votes as at Lyngby, but it is hoped that the new principles will be accepted and become applicable immediately after the Lyon Assembly.

**Bureau members consider an amendment. From left to right: Prof. A. D. Campbell, Dr. D. R. Lide, Jr., Prof. F. W. Sunderman, Jr., Prof. D. B. Tonks**

**Table 2. Comparison of NAO votes — Present and proposed systems**

| Band | NAO | 1984 NAO Subn. (US$$10^3$) | Votes at Lyngby 1983 | Votes now proposed |
|---|---|---|---|---|
| I | USA | 67.5 | 6 | 6 |
| | Japan | 38.3 | 6 | |
| | USSR | 40.0 | 6 | |
| | FRG | 28.9 | 6 | |
| | France | 21.1 | 4 | |
| | UK | 20.0 | 6 | |
| II | Italy | 17.3 | 4 | 5 |
| | GDR | 16.4 | 4 | |
| | Spain | 13.2 | 4 | |
| | Belgium | 12.5 | 4 | |
| | Netherlands | 11.5 | 4 | |
| | Canada | 10.0 | 4 | |
| | India | 9.7 | 4 | |
| | S. Africa | 9.6 | 4 | |
| | Poland | 9.5 | 2 | |
| III | Australia | 9.1 | 4 | 4 |
| | Romania | 8.6 | 4 | |
| | Switzerland | 7.5 | 4 | |
| | Brazil | 7.0 | 4 | |
| | Czechoslovakia | 7.1 | 4 | |
| | China/Beijing | 5.7 | 4 | |
| | China/Taipei | 5.7 | 4 | |
| | Sweden | 5.3 | 4 | |
| | Hungary | 5.0 | 2 | |
| | Argentina | 4.5 | 4 | |
| | Austria | 4.4 | 4 | |
| | Finland | 4.0 | 4 | |
| | Bulgaria | 3.9 | 2 | |
| | Norway | 3.3 | 2 | |
| | Denmark | 3.2 | 4 | |
| IV | Ireland | 2.3 | 2 | 3 |
| | Turkey | 2.5 | 2 | |
| | Egypt | 2.5 | 2 | |
| | Iraq | 2.5 | 2 | |
| | New Zealand | 2.5 | 2 | |
| | Yugoslavia | 2.5 | 2 | |
| V | Portugal | 1.5 | 2 | 2 |
| | Greece | 1.25 | 2 | |
| | Korea | 1.25 | 2 | |
| | Syria | 1.25 | 2 | |
| | Colombia | 1.25 | 2 | |
| | Israel | 1.1 | 2 | |
| VI | Cuba | 0.6 | 1 | 1 |
| | Venezuela | 0.6 | 1 | |
| | Malaysia | 0.6 | 1 | |
| | Peru | 0.6 | (1) | |

An analysis of the new voting pattern shows that the largest number of votes, sixty, would still be held by the mid-range (4-vote) member countries and that the 5-vote member countries would have forty-five votes. The combined number of 3, 2 and 1 votes would stand at thirty-four and the 6-vote countries would have thirty-six votes between them. It also shows that the voting system would be smoothed out considerably, in line with the dues, and that the total number of allocated votes would increase from 150 to 175.

The suggested wording for the new key "Membership" Statute, S5.1, is as follows:

> The Council, to which the Bureau, Executive Committee, Standing Committees, Divisions, Sections, Commissions and all other bodies of the Union are responsible, is composed of the Delegations of the Adhering Organizations. Each Delegation shall be assigned a specific number of votes (1–6) according to principles decided by the Council. Each Adhering Organization shall appoint its Delegates for every Council meeting. The number of Delegates shall not exceed the number of allocated votes.

Similarly, the "Entrance" Statute, S3.3, is recommended to be simplified to:

> A country requesting admission to the Union shall provide full information about its proposed Adhering Organization.

## National representation on Union bodies

During the period of office of Prof. Guy Ourisson as Secretary General, efforts were made to increase the number of National Representatives on Commissions. This had the effect of increasing the participation of chemists in IUPAC's affairs to a limited extent, but was chiefly aimed at encouraging each member country to have representation on relevant IUPAC bodies on which it had no elected members. Statistics produced at the Bureau meeting showed that there are now 294 Titular and Division Committee Members, 303 Associate and Coopted Members, and 376 National Representatives. Although IUPAC makes no contribution to National Representatives' expenses, they are supplied with all their Commission documents via the Secretariat and with free copies of CI. The Officers were concerned — not so much at the expense of postage and the supply of CI — but with the organizational burden placed on the Secretariat — equivalent to over twenty additional Commissions. A suggestion that a service charge of US$50 per biennium per National Representative should be paid by NAOs, to allow the recruitment of the necessary support staff for the Secretariat, was not approved by the Bureau on the grounds that maximization of participation from member countries is desirable. However, it was recognized that by no means all of the listed National Representatives are active by correspondence or by attending meetings of their Commissions. Accordingly it was decided in the meantime to ask Commissions to withdraw approval for National Representatives who were not active and to ask NAOs only to request representation by chemists who were prepared to be active in the Union. Should the numbers continue at the present level or increase, the Officers may need to raise the matter again in view of the increasing load being placed on the staff of the Secretariat by the ever expanding activity of the Union.

## Limitation of service on Commissions and Division Committees

The changes in the Statutes and Bylaws relating to the limitation of service of IUPAC Commissions and Division Committees, referred to in this Column in the October 1984 issue of CI, were approved by the Bureau substan-

**The Secretary General prepares to answer a query. From left to right: Dr. W. G. Schneider, President; Prof. T. S. West, Secretary General; Prof. C. N. R. Rao, Vice President**

tially as indicated, but with the addition of a phrase that all extensions beyond the norm will be granted for a 2-year period only. The Bureau also recommended a change to Bylaw 4.305 to the effect that reappointment of National Representatives beyond a total of 12 years of service will require the establishment of special circumstances by the NAO concerned. Several minor changes have been suggested to Statutes and Bylaws in addition to those that delete the words "categories of membership", but these are too detailed to warrant discussion here. NAOs will be notified of them in due course.

Meanwhile, the Bureau endorsed a proposal that the *IUPAC Handbook* should in future contain the Statutes and Bylaws of the Union with the proviso that they should still be available in the present pamphlet form. The new *Handbook* received a very warm welcome from Bureau Members.

## Future Congress meetings

The arrangements for the 30th International Congress of Pure and Applied Chemistry being organized by the Royal Society of Chemistry in Manchester, 9–13 September 1985, were noted by the Bureau with pleasure. Approval was given to a submission by Dr. R. Vlahov of the Bulgarian Academy of Sciences for the outline programme of the 31st Congress (Sofia, 13–18 July 1987), with eight Sections: Analytical Chemistry, Education, Engineering Chemistry, Industrial Chemistry, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, and Polymers. The Bureau suggested that a section on Clinical Chemistry might also be appropriate and the Division Presidents were asked to submit any other comments to Dr. Vlahov in writing before the end of the year.

The 1987 General Assembly will be held in Boston, USA (21–29 August) and the 1989 Assembly in Lund, Sweden (9–18 August). The 1989 Congress will be immediately before the Lund Assembly, but in Stockholm (2–7 August). Meanwhile, invitations have been received from the Hungarian Academy of Sciences to host the 1986 Bureau meeting in Veszprém for the end of August or beginning of September, and the Chinese Chemical Society has invited the Executive Committee to hold its 1986 Spring meeting in Beijing. The Bureau accepted these invitations in principle, subject to budgetary limitations. The Executive Secretary was nominated by the Bureau to act as the IUPAC coordinator with the 30th Congress Organization to ensure good cooperation.

St. Anne's College, Oxford, venue of the Bureau meeting

### Stand taken on access by all *bona fide* chemists to IUPAC meetings

In sponsoring symposia IUPAC has always insisted, as a condition of sponsorship, that there should be freedom of access to all *bona fide* chemists irrespective of race, religion or political persuasion. The Bureau noted with regret that access to India to attend the IUPAC-sponsored 7th International Biotechnology Symposium (New Delhi, 19–25 February 1984) had been denied to South African chemists by the Indian Government unless they signed a declaration of a political nature before being granted an entry visa. The Bureau expressed its concern at this condition attached to the granting of a visa. The matter was also being taken up by ICSU and the Executive Secretary was asked to delay action, pending the outcome of ICSU's decision during the following week.

### The shape of things to come

As readers will see, the Bureau's discussions were largely concerned with organizational matters in relation to the forthcoming Lyon General Assembly, but a good deal of science was also discussed at the meeting, particularly by Vice-President C. N. R. Rao in his biennial assessment of all IUPAC programmes and projects with individual Division Presidents. As Secretary General and "special agent" for our Editor, I was able to extract promises from all Division Presidents of articles on some of the most interesting topics discussed at the meetings. I hope that these will appear in future issues of CI and that they will stimulate readers' interests in some of the fascinating scientific work going on in the Divisions of the Union.

---

# Activities of the Inorganic Division since the 1983 IUPAC General Assembly

All Commissions of the Inorganic Division have been very active since the meetings in Lyngby, August 1983. The main topics are outlined in the following paragraphs.

During the period June 1983 – May 1984 the Commission on Atomic Weights and Isotopic Abundances (II.1) has completed the reports *Atomic weights of the elements – 1983* and *Isotopic composition of the elements – 1983,* which were published in PAC in June 1984. The comprehensive *Element by element review of atomic weights,* which surveys all changes of atomic weight values based on an assessment of physical and chemical data in the literature published since 1961, also appeared in the June 1984 issue of PAC. A *Table of atomic weight values to four significant figures* has been revised and submitted to the Chairman of the Committee on Teaching of Chemistry. At its meeting during the General Assembly in Lyon in 1985 the topics to be considered by Commission II.1 will include the status of non-terrestrial data, the policy on uncertainties for mononuclidics, and annotations for mass spectrometric measurements.

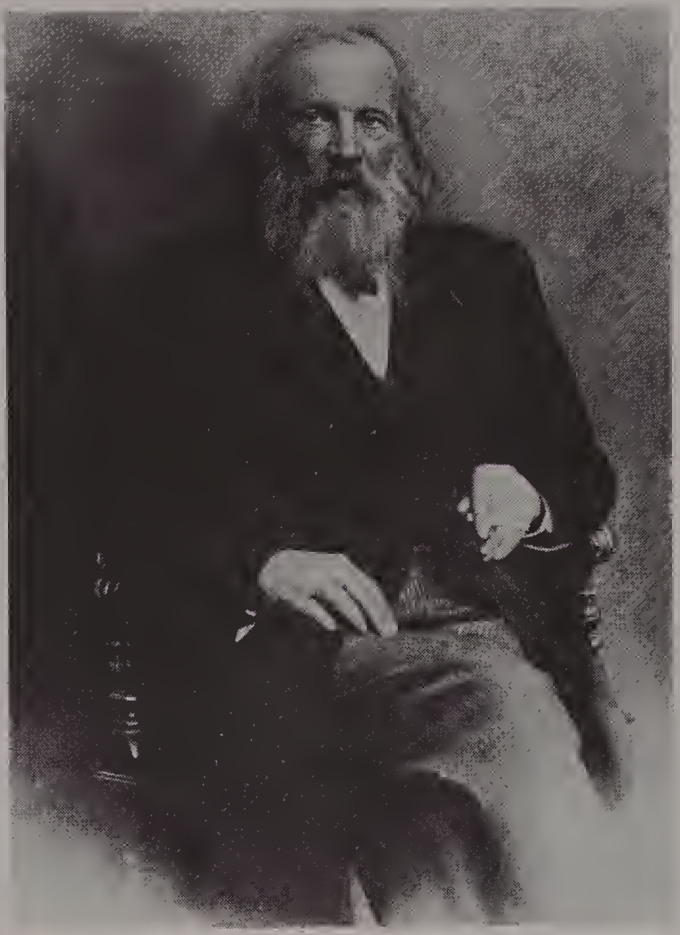
All efforts of the Commission on Nomenclature of Inorganic Chemistry (II.2) are concentrated on the revised edition of *The Nomenclature of Inorganic Chemistry* (Red Book). The first part of the Red Book is to be published in 1986 and will contain the following chapters: (1) Aims, Functions, and Methods; (2) Elements and Symbols; (3) Grammar; (4) Formulae; (5) Binary Compounds; (6) Solid State Chemistry; (7) Ions, Salts and Radicals; (8) Oxoacids; (9) Coordination Compounds; (10) Boron Compounds; (11) Neutral Molecular Compounds.

Among the projects in which the Commission on High Temperature and Solid State Chemistry (II.3) is engaged the *Handbook of Thermodynamic and Transport Properties of the Alkali Metals* is close to completion. The *Bibliography of High Temperature Chemistry and Physics of Materials* is continued on a subscription basis. Starting with Volume 27, issue No. 1, the bibliography is available for purchase on floppy discs. The final report on *Results of a collaborative study on zirconia-based oxygen gauges* has appeared in PAC, August 1984. The first part of an article on *Terminology and characterization of carbon* will be published in PAC in due course. An abstract will appear in CI.

**E. Fluck**

# 150th Anniversary of D. I. Mendeleev

by Dr. Z. Samoylova,
Scientific Secretary, National
Committee of Soviet Chemists


Dmitri Ivanovich Mendeleev (1834-1907)

Mendeleev's name is primarily associated with the periodic law of chemical elements. This fundamental law of nature, discovered by him in 1869, has become a starting-point for the development of many new trends in research from atomic structure to the evolution of matter in the Universe. In his scientific investigations Mendeleev combined both abstract analytical and concrete synthetical approaches. They gave him the opportunity to predict new facts and phenomena that, in turn, influenced favourably his versatile practical work.

The interests of Mendeleev as a scientist and a citizen were extraordinarily broad and various. So, on investigating the chemical composition of oil he fully realized its importance as the richest source of raw materials and studied methods of oil processing, transportation, geographical location of oil plants, oil economy, etc. Essentially he provided the basis for future petrochemistry and oil technology.

It was Mendeleev who first advanced the idea of the underground gasification of coal. On the one hand, this breakthrough to the technology of the future was based on laboratory experiments on fuel heat capacity and the generation of combustible gases from coal and, on the other hand, it was connected with exploration of deposits in Donetsk basin, industrial exploitation of which he promoted with a great deal of effort.

In a series of investigations devoted to the physical and chemical properties of water and aqueous solutions, Mendeleev developed the chemical theory of solutions and put forward the first ideas about the role of the solvent. Only quite recently has it become possible to appreciate fully the insight of Mendeleev's ideas concerning the use of water (and other) wastes and methods of purification of industrial waters. Of the same importance in our time is his reasoning about proper management of forest resources, about creation of agro–industrial complexes, about transition to the era of synthetic food, about the interconnection of technology and socio-economic theories, and many others.

Mendeleev left over 500 printed works, only one third of which is connected with chemistry, and the remainder comprising valuable investigations on chemical technology, physics, metrology, hydrodynamics, air navigation, astronomy, meteorology, agriculture, economics, problems of productivity in Russia and public education. Mendeleev realized the vitally urgent tasks and future of his motherland much better than the official authorities. Quite an epoch in the history of chemical education was Mendeleev's pedagogical activity to which he dedicated 35 years of his life. He was a brilliant lecturer and the author of manuals and high-school appliances. Many generations of students made use of *Principles of Chemistry*. This unique text-book, first published in 1869–1871, along with the draft of the periodic system, ran to eight editions during Mendeleev's life and was translated into English, German and French.

The richest creative heritage of Mendeleev continues to attract the attention of the broad chemical community in the Soviet Union and throughout the world. Mendeleev Congresses on General and Applied Chemistry regularly held in the USSR are a grateful tribute to the memory of his scientific genius. The first Mendeleev Congress was convened in St. Petersburg in December 1907 to pay the last honours to Mendeleev who died in March of that year. The

Congress Charter was adopted and a standing committee for the congresses was set up. By the time of the Second Mendeleev Congress in 1911 'Mendeleev's Study', a memorial museum, was opened in St. Petersburg. The Third Mendeleev Congress (Petrograd, 1922) was the first scientific meeting in Soviet Russia. Subsequent congresses have been held in Moscow (1925, 1959), Kazan (1928), Kharkov (1932), Leningrad (1934, 1969), Kiev (1965), Alma-Ata (1975) and Baku (1981).

The programmes of Mendeleev congresses reflected the historical development of chemical science and its prospects. Resolutions passed at the congresses were aimed at promotion of creative activity of scientists and at the implementation of Mendeleev's ideas applied to contemporary needs. Each Mendeleev congress turned into a festival of science, attracting thousands of participants. Prominent Soviet scientists and specialists, and leaders of industries delivered lectures at the congresses. Among the foreign guests at Mendeleev congresses were S. Arrhenius, K. Fajans, Ch. Raman, G. Seaborg, P. Hagenmuller, S. Bergström, B. Lindberg, P. Savich, J. Balaceanue, J. Casida, H. Freiser, F. Marta, H. Keil, J. Gažo and many others. Unlike specialized conferences and symposia, Mendeleev congresses reveal both the differentiation and the integration of science. The analysis of integrating factors in the development of chemistry and chemical technology provides an opportunity to establish the most promising current trends at the juncture of various fields of chemistry and to concentrate every effort to the solution of the most important scientific and economic problems.

The XIII Mendeleev Congress on General and Applied Chemistry, held in Leningrad, 21–25 May 1984, was dedicated to the 150th anniversary of D. I. Mendeleev. It was sponsored by the USSR Academy of Sciences, together with the Mendeleev All-Union Chemical Society, the Ministry of Chemical Industry, the Ministry of Oil Refining and Petrochemical Industry and the Ministry for the Production of Mineral Fertilizers. Over 2000 participants, including about 150 foreign scientists from 17 countries, attended the Congress.

The Congress was inaugurated by the introductory speech of Academician Yu. Ovchinnikov (Chairman, Organizing Committee). L. Zaikov (first secretary, CPSU Leningrad region) delivered a conglatulatory address from the Central Committee of the CPSU. The Participants were welcomed by H. Wischovsky (Chairman, COMECON Committee of Chemical Industry Ministers) and W. Fritsche (Secretary, Federation of European Chemical Societies). The Mendeleev Gold Medal was solemnly awarded to Academician V. Spitsyn, a well-known specialist in the chemistry and technology of rare and radioactive elements and of coordination compounds.

Plenary review papers on the contribution of Mendeleev to the development of chemistry and industry, and on the actual questions and the main tendencies of modern chemistry, were included in the programme of the jubilee celebration.

Academician Spitsyn's lecture was devoted to the Mendeleev periodic law in the light of modern theories of the structure of matter. In particular he discussed a new stage in the development of the concept of valency, consideration of permitted relativistic effects to explain better the properties and fine differences between similar elements, and studies of properties of uranium and transuranium elements in unusual valency states.

**Professor K. Saito delivers a lecture**

Development of Mendeleev's ideas in modern inorganic chemistry was illustrated by Prof. K. Saito (Japan) who considered the relationship between the reactivity of coordination compounds of transition metal ions and the location of the element on the Periodic Table. The present state of the chemistry of gallium, scandium and germanium, the three elements predicted by Mendeleev and discovered later, was treated by Prof. L. Kolditz (GDR). Silicates played a certain role in the development by

**Academician V. Spitzyn after award of Mendeleev Golden Medal (with Academician Yu. Ovchinnikov to the right of him)**

Mendeleev of concepts about definite and indefinite compounds. Academician M. Schultz analyzed Mendeleev's work on silicates in natural and glass-like states and displayed the modern features of silicate chemistry and its influence on adjacent fields of chemistry, geochemistry, mineralogy, and technology of silicate materials.

An overall survey of modern chemistry, with retrospective review of Mendeleev's works and projects, was made by Academician N. Emanuel. He considered in detail, on the one hand, all of the most important trends of pure chemistry and, on the other hand, the outcome of fundamental researches in various applied spheres, thus giving a striking picture of the gigantic progress of natural science in the 20th century. Academician V. Koptyug thoroughly discussed burning topics of the day concerning applications of computers to solve the tasks of organic chemistry, to deal with problems of the systematization of chemical information, and to create and employ chemical data bases. The speaker shed light upon the recent progress of Institutes of the USSR Academy of Sciences on computerizing of researches. He stressed the necessity for different scientific bodies to be united in the common purposeful project on the creation of an artificial complex memory system for organic chemistry.

The Congress paid much attention to further development of industry. Mendeleev's words ". . . as without science there cannot be modern industry, similarly, without the latter there cannot be modern science . . ." have acquired deep

**Academician V. Koptyug presenting a lecture**

meaning today. When characterizing the development of chemical industry in the USSR, Minister V. Listov cited interesting figures and facts. For instance, the growth rate of the chemical industry is 1.5 times faster than industry as a whole; from 1966 to 1980 chemical turnover increased by 3.9 times, with 9.5% as average annual rate of growth. Efforts of the scientific and producing bodies of chemical industry are concentrated on the creation of a new generation of technological processes (using membranes, low-temperature plasma, ultrasonics, lasers, shock waves, cryogenics, etc.), new catalysts and biocatalysts, increasing the stability of polymeric materials, reducing energy consumption, raising of equipment power and reliability, and complex utilization of raw materials. In future years preferential development will be provided for production of chemicals essential for the fulfilment of national economy programmes: Food Supply, Energy, Environment Protection, Production of Consumer Goods. This is a convincing example illustrating the realization of Mendeleev's ideas.

Minister V. Fedorov drew attention to the practical realization of Mendeleev's ideas and foresight on oil-refining and the petrochemical industry. Among the current problems of this branch of industry is the raising of the effectiveness of oil utilization—including improvement in the quality of oil refining, maximal use of residual fuel and heavy oils, gas condensate hydrocarbons, casing-head and natural gases. Only last year the installation of modern improved methods of oil refining resulted in increasing the production of motor fuels by 3%. Other important tasks are improvement in the properties of catalysts, recycling of carbon, hydrogen, sulfur and other elements released into the environment, rapid upgrading in the selectivity of petrochemical processes, complete utilization of raw materials and by-products, production of synthetic liquid and gaseous fuels from coals, oil shales and bituminous rocks. A large research programme is being carried out by the petrochemical industry in cooperation with 32 academic Institutes and 27 Universities.

Academician N. Zhavoronkov elucidated in his report the role of Mendeleev in the history of science and culture and characterized the outstanding personality of Mendeleev, his philosophical views and social activity, the profound interconnections of a scientific idea with its practical realization. D. I. Mendeleev was one of the active founders of the Russian Chemical Society (1868), later the Russian Physicochemical Society (1878). He delivered over 125 lectures at the meetings, and published over 135 papers in Journals, of the above learned societies. Now the All-Union Chemical Society named after D. I. Mendeleev unites over half a million members, including scientists, engineers, technicians, lecturers and pedagogues. Academician A. Fokin, the President of the Society, spoke on its history and activities, and the tradition of Mendeleev Congresses.

During the Leningrad Congress there was a book exhibition 'D. I. Mendeleev — 150th Anniversary' (from the stocks of libraries), a photographic exhibition 'Life of D. I. Mendeleev', as well as exhibitions 'Automation methods and instruments for research work' and 'Achievements of Leningrad chemists', information centres of 'Soyuzkhimreaktiv' and Hungarian 'Reanal' and 'Medimpex'. An excursion 'Mendeleev in Petersburg', visit to the Mendeleev apartment-museum, to the Museum and Institute of Metrology (formerly The Main Chamber of Measures and Weights, whose organizer and first director was D. I. Mendeleev), were arranged for participants of Congress.

The XIII Mendeleev Congress on General and Applied Chemistry convincingly demonstrated the importance of chemistry in modern life and general tendencies of its development towards scientific-technical and social progress. It once again provided proof of Mendeleev's words—"Science is a concern of the entire society . . . and scientific seeds will produce a bountiful harvest for the people".

**Academician N. Zhavoronkov lays flowers upon the grave of D. I. Mendeleev**

# Federation of European Chemical Societies (FECS) General Assembly

Nineteen member societies and one corresponding society of FECS were represented at its 15th General Assembly in London, UK, 14–15 June 1984. In the absence of Prof. V. P. Zubov (USSR), the meeting was chaired by Sir Ewart Jones on behalf of the host country. The delegates stood in honour of Prof. J. M. Gamboa, who died on 10 February 1984. Prof. Gamboa had been the delegate of the Royal Spanish Chemical Society (since the creation of the Federation in 1970) and a member of the FECS Advisory Board and Executive Committee.

A survey on *Education in Analytical Chemistry in Europe — 1983* was undertaken by the **Working Party on Analytical Chemistry** with the cooperation of 160 universities from 21 countries. Details are available from Prof. R. Kellner (Austria) and will be published in *Fresenius Z. anal. Chem.* The invited plenary and keynote lectures from EUROANALYSIS V (Cracow, Poland: 26–31 August 1984) will be issued in a collected volume in the series *Reviews on Analytical Chemistry*. The proceedings of the 2nd European Conference on Chemistry and the Environment (Lindau, FRG: 24–27 May 1984) will be published by Verlag Chemie towards the end of this year. Organized under the auspices of the **Working Party on Chemistry and the Environment,** the main theme was *Air Pollutants Affecting Plants,* including indirect effects through water and soil. The **Working Party on Food Chemistry** conducted a ring-test — EURO COLAB I — on the determination of trace amounts of aflatoxin $M_1$ in milk powder. The results were presented at the symposium on *Challenges to Contemporary Dairy Analytical Techniques* (Reading, UK: 28–30 March 1984) and are available from Dr. P. B. Czedik-Eysenberg (Vienna). An enquiry into the amount (decrease) of laboratory work during chemical studies at universities has been initiated by the **Working Party on Chemical Education.**

**Prof. H. Dutler, Swiss Committee of Chemistry, talking to Prof. D. Sunko, Union of Yugoslav Chemical Societies, with Dr. A. Jakabos (centre), Hungarian Chemical Society and Joint Secretary of FECS, looking on**

**Dr. Williams negotiates with Dr. Salzmann?**

The VI FECHEM Organometallic Chemistry Conference will be organized by the All-Union Mendeleev Chemical Society at Jurmala/Riga, USSR, 10–15 September 1985, in commemoration of Prof. Razuvayev's 90th birthday.

A review of the activities (1973–1983) of the **Working Party on Professional Affairs** can be obtained from Dr. W. Fritsche (Frankfurt). The proceedings and recommendations for further action arising from the symposium on *Health and Safety in the Chemical Laboratory. Where do we go from here?* (Lancashire, UK: 12–13 April 1983) are now available from Mr. B. A. Henman (London), as is the Working Party paper *Chemists and Ethical Conduct: To Strike or not to Strike?* presented at the 1984 RSC Annual Congress. An interface paper *Professional Workers and Trade Unions* (see pp. 33–36) outlines the conflicts of duties of a chemist to a trade union and responsibilities to the profession of chemistry.

Despite some doubts, the General Assembly adopted a recommendation to establish a network for collection, coordination and dissemination of information and experiences of individual chemists and member societies for the benefit particularly of chemists in developing countries. Initially the Hungarian Chemical Society will provide the necessary administrative support for the activities of the network.

Prof. H. El-Sissi (observer from Egyptian Chemical Society) said that the political parties in his country passed a bill which had been signed by the President and became effective in Autumn 1983. This law imposed a small tax on all heavy chemicals, cement, paper, fertilizers, pesticides and oil for the benefit of the Professional Society of Natural Scientists in Egypt. The total amount of £E2–3 million a year is available for social and scientific purposes.

The Assembly was preceded, on 13 June, by a seminar on *The Royal Society of Chemistry, Parliament and Government.* Mr. B. A. Henman said that over the past 7 years RSC had maintained contact with Parliament through Society luncheons for senior members of the Government or Opposition, a Parliamentary Links Scheme, direct contact with members of both Houses of Parliament, and through its two Parliamentary Adviser MPs, Mr. D. Crouch and Mr. D. Anderson. The latter surveyed ways in which Members of Parliament can be kept informed of matters of concern to the RSC and its members. It is not sufficient today just to write letters to Ministers and MPs at the last minute in order to have opinions considered. A continual approach to the legislators is an essential part of keeping Parliament in touch with outside life. The range of chemical issues in which the Links Scheme had been used was extensive: from employment legislation to companies legislation, from urea formaldehyde foams to cadmium in the soil.

**M. Williams**

# DIVISION PRESIDENTS' REPORTS TO THE BUREAU

## OXFORD, 16–17 September 1984

Five of the Division Presidents' reports were published in CI, 1984, No. 5, pp. 7–17. The remaining two, which became available too late to be included in that issue, are reproduced below.

## II. INORGANIC CHEMISTRY DIVISION

II.1. Commission on Atomic Weights and Isotopic Abundances.
II.2. Commission on Nomenclature of Inorganic Chemistry.
II.3. Commission on High Temperature and Solid State Chemistry.

Since the IUPAC Assembly Meeting in Lyngby, the Division has continued its high level of activity, primarily through its Commissions. Several significant projects have been completed, highlighted by the *Element-by-element review of atomic weights* by Commission II.1 and the *Handbook of thermodynamics and transport properties of the alkali metals* by Commission II.3. Significant progress has been made by Commission II.2 on the revision of the Red Book (the 1970 edition of the rules of nomenclature of inorganic chemistry) and they hope to meet an early 1986 publication date. The Division Executive Committee met in Boulder, Colorado, at the 23rd International Conference on Coordination Chemistry in late July to review on-going Divisional programmes and to plan activities for the IUPAC General Assembly in Lyon in 1985. The Division Officers continue to be concerned about the reduction in Division Committee and Commission members and the inability of IUPAC to plan new activities which would foster international science and make IUPAC more relevant both to individual scientists and to chemical organizations. The Division's long-time activities in atomic weights and nomenclature are representative of IUPAC contributions to the foundation and interchange of international chemistry. The Commission on High Temperature and Solid State Chemistry (II.3) is an example of what can be done in a particular area of current interest where timely reports and contributions are essential. The Division has also participated in the development of interdivisional commissions by appointing members (and allocating Divisional funds) to the stereochemical terminology working party of Commission III.2 and the Commission on Analytical Radiochemistry and Nuclear Materials (V.7). Some details of Commission work during the past year are outlined below.

### Commission activities

### Commission II.1

1. Two reports from the 1983 meeting in Lyngby, Denmark, have been completed and sent to the Executive Editor, IUPAC, for publication in PAC. *Atomic weights of the elements – 1983* and *Isotopic composition of the elements – 1983* appeared as separate reports.
2. The comprehensive *Element-by-element review of atomic weights,* which surveys all changes to

atomic weight values which have been made since 1961 based on an assessment of published physical and chemical data, has been forwarded to the Executive Editor, IUPAC, and was published in the June 1984 issue of PAC.

3. The *Table of atomic weight values to four significant figures* has been revised and submitted to the Chairman of the Committee on Teaching of Chemistry (CTC).
4. A small group of Commission members held a two-day meeting on 26–27 July 1984, at the National Bureau of Standards, Washington, DC to discuss the question of assigning uncertainties in isotopic measurements and related matters.
5. Members are preparing reports on a number of ongoing matters for consideration by the Commission at its next meeting at Lyon in 1985. These include *The status of non-terrestrial data, Policy on uncertainties for mononuclidics, Annotations for mass spectrometric measurements,* and a position paper on the terminology of 'Atomic Weight', 'Molar Mass', etc.

## Commission II.2

The Commission's entire effort is being devoted to the revision of the Red Book. The new regulations established by IDCNS to provide a 'referee' scheme to improve the input from the chemical community prior to the publication of IUPAC recommendations have caused some delay in the work schedule of the Commission although it is yet too early to evaluate the benefits from the additional exposure. The Commission still plans to complete the revision of the first volume by 1985. Specific accomplishments include:

1. The chapters on Formulae; Elements; and Symbols, Ions, Radicals and Salts have been approved by the Commission, fully edited and refereed. All will be forwarded shortly to IDCNS with only one requiring further Commission discussion.
2. The chapter on Polyoxo-anions has been refereed and will be sent to IDCNS after some revision and Commission discussion.
3. The four chapters on Grammar, Solid State Chemistry, Coordination Compounds, and Oxoacids have been revised and are expected to be approved by the Commission in 1984.
4. The chapters entitled Aim, Function and Methods; Neutral Molecular Compounds; and Boron Compounds have undergone initial revision but are not yet ready for Commission approval. Neutral Molecular Compounds has some overlap with the work of the Organic Nomenclature Commission which must be resolved and the chapter on boron compounds is still in a preliminary state.
5. The Commission has begun the preparation of a set of definitions for each chapter to be given to Prof. Gold of Commission III.2 who is preparing a glossary of terms within the activities of the organic nomenclature working groups.
6. A document has been jointly prepared on Inorganic Polymers with the Commission on the Nomenclature of Polymers. The manuscript has been finalized and has been forwarded to IDCNS.

## Commission II.3

This Commission has been very active during the past twelve months with a number of documents and projects. This group has prepared several sets of data which should be of great value to the chemical community; they have been particularly active in utilizing computer data storage and retrieval. Specific examples of their efforts follow:

1. Work on the *Handbook of Thermodynamic and Transport Properties of the Alkali Metals* is progressing satisfactorily. By July 1984 all the chapters will be typed on laysheets and at the September meeting the finished manuscript will be presented to the Commission.
2. Publication of the *Bibliography of High Temperature Chemistry and Physics of Materials* is being continued on a subscription basis. Starting with Volume 27, issue No. 1, computer searches are now possible, and issues are now available for purchase on floppy disc.
3. Since more and more data banks are now offering thermodynamic data on a commercial basis, a final decision on the *IUPAC Thermochemical Data Bank* will be taken at the September meeting of the Commission.
4. The final report on *Zirconia-based electrolytes for high temperature solid state oxygen gauges* is now in print in PAC and reprints will be ready for distribution shortly.
5. The report on *Melting points of refractory oxides: Part II* will be ready for submission to PAC at the September meeting. Work on the determination of melting points of $Gd_2O_3$, $HfO_2$ and CaO is progressing.
6. The first part of a manuscript on *Terminology and characterization of carbon* has been submitted for publication in PAC. Since it was decided that the subject matter is one of nomenclature, an abstract is in preparation for circulation in CI.
7. Samples for the study of Carbide-Graphite Secondary Temperature Standards have been prepared and sent to the participating laboratories for round-robin standard data compilation.
8. Reports on the *Classification of $Si_3N_4$-based materials* and on the *Properties of $Si_3N_4$ powders* are in preparation and will be submitted to the Commission at the September meeting.
9. Additional data have been added to the draft report on *Reference electrodes for solid state EMF studies* and an up-dated version is in preparation.
10. The revision of Chapter 9 of the Red book entitled *Crystalline Phases of Variable Composition* is being continued by the Working Group on Nomenclature of Non-Stoichiometric Compounds with Prof. R. Metselaar as the new Group leader.
11. A highly successful meeting, the Fourth International Conference on High Temperature and Energy Related Materials, sponsored by IUPAC and organized by Commission II.3, was held in Santa Fe, New Mexico, USA, 2–6 April 1984. An informal meeting of ten members of the Commission took place at the close of the conference. This group decided to continue the study of High-Temperature Mass Spectrometry Ionization Cross-Sections.

12. A corrected write-up of the *Comments on IUPAC recommendations concerning the thermodynamic standard state* was prepared to be circulated among the IUPAC Commissions concerned with the change.

**Mary L. Good**

## VI. APPLIED CHEMISTRY DIVISION

- VI.1. Commission on Food Chemistry.
- VI.2. Commission on Biotechnology.
- VI.3. Commission on Oils, Fats, and Derivatives.
- VI.4. Commission on Atmospheric Environment (*under review*).
- VI.5. Commission on Pesticide Chemistry.
- VI.6. Commission of Water Quality (*under review*)

### Commission activities

#### Commission VI.1

The Commission on Food Chemistry has been restructured to include six Titular Members and ten Associate Members. Each Associate Member is a chairman or co-chairman of a Working Group. Currently, the Commission has nine Working Groups: Mycotoxins, Aquatic Biotoxins, Animal Drugs, Direct Food Additives, Polycyclic Aromatics, Nitrosamines, Elemental Analysis, Natural Toxicants, and Halogenated Hydrocarbon Contaminants. A Working Group addressing the effects of food processing on food components is under development. Since the Lyngby meeting, the Commission has identified each Working Group chairman, developed Function Statements describing the scope of activities of each Working Group, initiated the process of identifying participants (co-opted members) in each Working Group, and developed a series of proposed projects for discussion and approval of the Commission at the next meeting in Washington, DC, 22–24 October 1984. At the same time, planned activities under previously approved projects have continued.

Since the Lyngby meeting the Commission has selected and obtained IUPAC approval for the 6th International Symposium on Mycotoxins and Phycotoxins. This Symposium will be sponsored jointly by IUPAC and the South African National Adhering Organization, the Council for Scientific and Industrial Research, in Pretoria, South Africa, 22–25 July 1985. The Organizing Committee has been established with Dr. P. Steyn as Chairman, an excellent scientific programme developed, facilities identified and reserved, and potential speakers contacted. The first notice of the Symposium was published last spring and a second notice will appear this fall. Arrangements have been made to publish the plenary lectures in PAC. To date 400 delegates, 180 from abroad, have registered to attend the Symposium.

#### Commission VI.2

1. The report on *Recommendations for the measurement of cellulase activities* has been completed and is being submitted to IUPAC for review for publication.
2. The first draft of *Recommendations on the measurement of hemicellulase activities* has been prepared by T. K. Ghose and has been circulated to Commission Members and outside experts for comment.
3. The report on *Recommendations for microbiological quality standards for mycoinsecticides* has been completed and is being submitted to IUPAC for review for publication.
4. A proposal for *Recommendations for microbiological quality specification for bacterial insecticides* has been prepared by the Commission and is now being circulated to outside experts. This project is expected to be completed prior to the Lyon meeting.
5. The project on Microbial Biomass for Animal Feed Derived from Agricultural Residues Using Mixed Cultures by Prof. Ringpfeil is well underway and a draft report for Commission review will be available prior to the Lyon meeting.
6. A new project on Recommendation for Standardization of Assays for Amylolytic Enzymes is being prepared by Dr. M. Linko. It will be submitted shortly for Division approval.
7. A new project proposal on Standards of α-Glucosidase Contamination of Glucose Oxidase is being prepared by Dr. G. G. Stewart.
8. The Commission has discussed at length at its recent meeting the two project proposals, on Air Sterilization and on Membrane Evaluation, that were not accepted earlier. The Commission feels that these projects are important and that standardization of methods is needed by the biotechnology community. The project on Standard Methods for Characterizing Air Filters is equally needed and the Commission is requesting that it be approved. At the present time, IUPAC is the most suitable organization to sponsor this project. It was decided to postpone the Membrane Evaluation project until the Air Sterilization project has been completed.
9. In addition, during the New Delhi meeting, the Commission met members of the International Committee on Economic and Applied Microbiology (ICEAM), the European Federation of Biotechnology (EFB), and the Industrial Biotechnology Association (IBA) to discuss the need for international coordination of activities in biotechnology. The areas requiring coordination include: nomenclature, standards of methods and materials, and timing of international symposia in biotechnology. Since these interests overlap with IUPAC goals, it is felt that the Biotechnology Commission should play an active role in this effort. Whether the Commission, under IUPAC, should take a lead role or not is still under discussion.

#### Commission VI.3

With the nomination, last year, of National Representatives for Israel and Malaysia, the Commission now covers thirty-three countries, corresponding to nearly fifty Members (T.M. + A.M. + N.R.).

Eleven Working Parties were active this year. Thirty-nine Members and twenty external collaborators received, at their request, documents and samples for analysis. Most of the participants were active in several working groups each. The objectives of these working groups were the elaboration of analytical methods for fatty acids based on fat soluble emulsifiers, commercial lecithines (general methods, impurities, composition), solvent residues in oils (by GLC) or in oilseed cakes (by GLC of head space), (*n*-3) polyenoic acids and butyric acid in dietary fats (by GLC), tocopherol content (by HPLC), thiobarbituric acid value (spectrometric) and traces of metals — Cu, Fe, Ni (by direct AAS).

The drafting of the formerly adopted methods has continued, in spite of the difficulties encountered in the republication of the 6th Edition of the *Standard Methods for Analysis of Oils, Fats and Derivatives.*

Liaison with other international organizations through their groups of experts, has been maintained (ISO TC34 SC11 and 2; Codex Alimentarius; FOSFA; COI; FIL; IDF; OICC; IOCC; IASC) and when possible, developed. Observers of most of these Organizations attend the meetings of the Commission and often participate in the Working Groups.

### Commission VI.5

Reports on two completed projects have been published in the series *IUPAC Reports on Pesticides* in PAC — *Non-extractable pesticide residues in soils and plants* (No. 17) and *Improved cost-effective approaches to pesticide residues analysis* (No. 18). A third report, *Microbial adaption to pesticides* has been submitted for review and a fourth, *Critical evaluation of model ecosystems* is now being prepared for publication.

The Commission has held one meeting during the period of this report — at Schlangenbad, FRG, 15–20 July 1984. Seven projects were reviewed of which three are scheduled for completion in 1985; the others are at an early stage of consideration. All these projects and their status are summarized in the brochure of the Applied Chemistry Division.

Plans for the 6th International IUPAC Congress on Pesticide Chemistry, to be held in Ottawa, Canada, 10–17 August 1986, are proceeding satisfactorily.

## General matters

### Division booklet

With the kind assistance of the Division Secretary, Dr. Coles, a booklet (loose-leaf format) on Division and Commission terms of reference and projects has been prepared. It is intended for use within and outside the Union with the aim of supplying information on the Division's various activities.

### Suspended Commissions

In pursuance of topic 18/83, Minutes of the 48th Bureau Meeting, proposals for membership and potential project areas were submitted to the President of the Union, with the aim of establishing new Commissions on Atmospheric Chemistry and Water Chemistry.

If established, the Commission on Atmospheric Chemistry could hold its first meeting (4 Titular Members) in November 1984 in Lübeck, FRG, financially based on a special grant made available by a German company.

Proposals for membership of the Commission on Water Chemistry were considered in discussions with Prof. Malz. By further correspondence, several scientists were contacted for their views on possible projects and their willingness to serve as members of the Commission. Based upon the individual reactions received, the potential membership, as proposed, was selected. If established, the Commission would first meet in 1985 (General Assembly), but a group of two or three new members would be invited to hold a preparatory meeting in advance.

### Harmonization Symposium

Preparations for the participation of the Division in the International Symposium on the Harmonization of Collaborative Analytical Studies (to be held in Washington, DC, in October 1984, in conjunction with the AOAC), are continuing. Dr. Coles has kindly agreed to continue the late Dr. Egan's assignments in this context.

**H. Frehse**

---

# Conference on Infant Formula

The Association of Official Analytical Chemists is sponsoring a Conference on Infant Formula (baby food) at Virginia Beach, Virginia, USA, 14–16 May 1985. The basic aim of the Conference is to attract manufacturers, medical researchers, regulatory authorities and analytical chemists to discuss their problems and try to find mutually agreed solutions. The Conference will consist of invited lectures and contributed papers, oral and poster.

---

# International Conference on Rare Earth Development and Applications

The Chinese Society of Rare Earths is organizing the above Conference, to be held in Beijing, China, 10–14 September 1985. Topics to be covered include: Rare earth resources, geochemistry and ore dressing; Applications in materials science and engineering; Applications in steel, cast iron and nonferrous metals; Chemistry and catalysis in petroleum and chemical industries; Production technology; Applications in agriculture, medicine, dyeing and tanning. Further information can be obtained from Mr. Tang Kefeng, 2 Xinjiekon Wai Dajie, Beijing, China.

# Mendeleev and the periodic classification of the elements

by Dr. Norman E. Holden
Commission II.1

*Foreword for scientific experts reading this semi-technical paper*

*It may not previously have been brought to your attention that truth and clarity are conjugate variables (in the Heisenberg sense) i.e. they are somehow inversely related. When one is completely determined, the other is left undefined. As a result, those readers who think that they have uncovered errors in this paper should understand that truth may have been knowingly forfeited to obtain clarity. On the other hand, those readers, who find the discussion obscure, should appreciate that some truths are being introduced without formal presentation.*

## INTRODUCTION

Mentioning 1984 to the man on the street brings to mind 'big brother', 'doublespeak' and other artifacts of the world of George Orwell. What does it mean to scientists? 1984 marks the sesquicentennial of the birth of the Russian scientist Dmitri Ivanovich Mendeleev, the chief architect of the Periodic Table. Mendeleev, who was the youngest of fourteen* children, was born in Tobolsk, Western Siberia on 8 February 1834.† But wasn't Mendeleev merely one of at least half a dozen nineteenth century scientists who worked on the Periodic Table? What gave him such a prominent position, when he wasn't even one of the first to think of the concept? During this time period in the middle of the last century, the leading scientific centers were universities in England, France and Germany. How did a Russian become involved anyway? What was so significant about Mendeleev's work that he became one of only seven scientists to have a chemical element named in their honor?

Dr. Norman E. Holden, Commission II.1

The original Table was constructed using the ascending order of atomic weights of the elements. Why then did it take almost 70 years from the inception of the atomic weight concept to the Periodic Table? The Table illustrates the Periodic Law, i.e. if chemical elements are arranged in the order of their atomic weights, then at certain regular intervals (periods) elements occur having similar chemical and physical properties. At the beginning of the nineteenth century, a chemical element was defined as a substance that could not be broken up into simpler parts (with different properties) by any known means. The Table was first suggested in an era when no one had any clear idea of how many elements might exist. It gave great impetus to chemical work because regularities in element properties implied that the elements must have more in common than merely their resistance to all efforts at further separation.

In the past half-century, the only changes in the Table have generally involved adding the name of a newly discovered element, but it wasn't always that way. There have been basic problems with the Table as originally proposed. There were a number of pairs of elements which could only be accommodated into the Table by ignoring the basic rule for the Table's construction. How can you justify that for a seemingly universal law? There were over a dozen elements with somewhat similar properties for which only one location was available in the Table and another half-dozen for which there was no space at all. In the first decade of this century, there were new elements being discovered almost daily and bewildered scientists could not figure out where to place them in the Table. In addition to looking at these interesting questions, let's also see what is new in the way of modifications being considered today for this 'unchanging' Chart.

---

*Although most sources list Mendeleev as the fourteenth and last child, a few sources, e.g. the Great Soviet Encyclopedia (pre-1917) list him as the seventeenth and last child.

†Mendeleev's birthdate was 27 January in the old style Julian calendar followed in Russia at that time. Russia converted to the present Gregorian calendar in February 1918, after the October Revolution (1917) so that the Revolution is now actually celebrated in November.

## ATOMIC WEIGHT VERSUS EQUIVALENT WEIGHT

The key to early periodic systems was the ordering of the elements by their atomic weight. The concept of atomic weight originated with the English scientist and teacher, John Dalton[1], in 1803. Dalton was attempting to explain why different amounts of various gases dissolve in a liquid by comparing the relative weights of these substances. His scale assigned a weight of 1 to hydrogen. When Dalton published his atomic theory[2], he included tables of atomic weight values. However, when two elements combine in a compound, it is insufficient to merely determine the percentage of each element present to obtain correct atomic weights. One must also determine the valence of each element in the compound. Valence is a measure of how many atoms of one element combine with an atom of the other element, e.g. is water HO, or $H_2O$? Unfortunately, this is a 'Catch-22' situation since it can not be determined until the atomic weight is known. Early experimenters assumed, in the absence of evidence to the contrary, that a compound was made up of molecules containing one atom of each element. This monatomic hypothesis created difficulties in understanding reactions. The rule worked in many situations, but there was a large number of cases in early atomic weight tables where the assumed valence was not correct. Thus, equivalent weights‡ (or proportional numbers as they were called, since they were ratios of elements) were quoted rather than the atomic weight. This problem of listing atomic weights for some elements and fractions of atomic weights for other elements obscured the true periodicity of the elements. It delayed development of the Periodic Table for some 60 years.

Actually an Italian lawyer and physicist, Amedeo Avogadro, solved this problem[3] in 1811. He used the results of the French scientist Joseph Louis Gay-Lussac on combining volumes[4]. Gay-Lussac determined that gaseous elements combined in chemical reactions in simple (numerical) volume ratios. Avogadro, then, hypothesized that equal volumes of different gases under the same conditions contain equal numbers of molecules, a possibility that Dalton had considered and rejected, although without the benefit of Gay-Lussac's data. Avogadro also assumed that common gaseous elements consisted of two-atom molecules. Unfortunately, Avogadro used the term molecule throughout the paper, either alone or with a series of qualifying adjectives such as integral, constituent and elementary. Each of these had a different meaning. In those days, the terms atom and molecule were often used interchangeably so that some scientists reading the paper understood Avogadro to imply that there could be half-atoms. Regrettably as a result of this confusion, his paper was ignored by chemists for the next half century until it was rediscovered by the Italian chemist, Stanislao Cannizaro, who presented Avogadro's solution[5] to the world's leading chemists at the first International Scientific Conference in Karlsruhe, Germany (3–5 September 1860). This conference had been called because of the confused situation with regard to the terminology of molecule and atom and the fact that two sets of atomic weight values were in existence, one for inorganic compounds and another for organic. In spite of this aim, no conclusions were agreed upon at the Conference but Cannizaro's presentation influenced the thinking of young chemists who attended, including Mendeleev and the German chemist (Julius) Lothar Meyer.

Mendeleev's early interest in natural science had been fostered by an older brother-in-law, who was a Decembrist§. He was 26 years old and studying abroad at the University of Heidelberg, prior to obtaining his doctorate at the

---

‡The equivalent weight of an element in any compound is equal to the atomic weight of the element divided by the valence of the element in that compound.

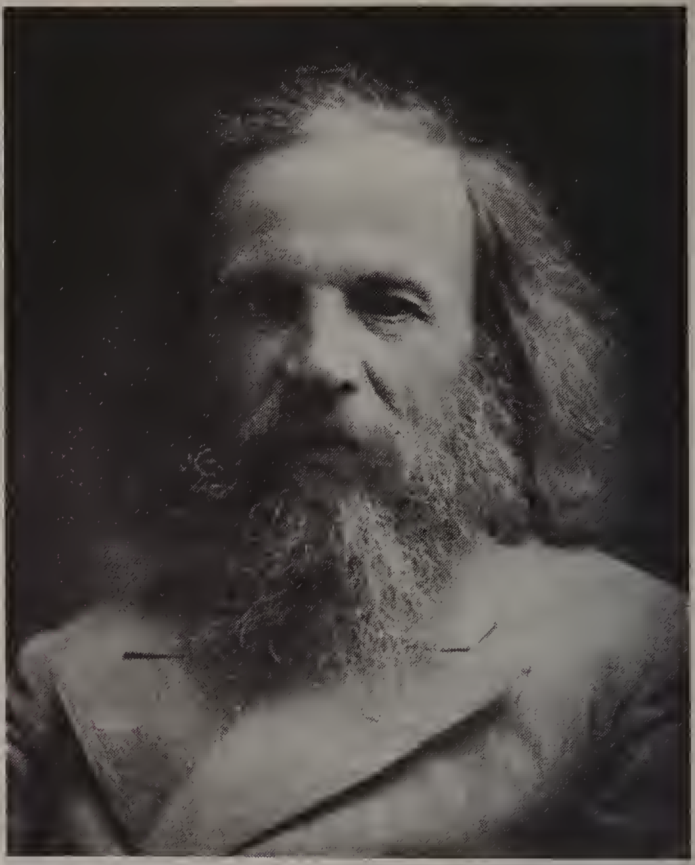
§When Czar Alexander I died in December 1825, he left no direct male heir. His brother Constantine was next in line, but he renounced the throne and swore allegiance to his younger brother Nicholas. Some Army officers led a rebellion against Nicholas and in favor of Constantine called the Decembrist Rebellion. The leaders were later executed and the remaining dissidents sent to Siberia, a place of banishment for political exiles, e.g. following his abdication in 1917, Czar Nicholas II and his family were originally sent to Tobolsk (Mendeleev's birthplace).

University of St. Petersberg (Leningrad), when he attended the Conference. The 30-year-old Meyer was in his second year as a private teacher (privat-dozent for physics and chemistry) at the University of Breslau, when he heard and read Cannizaro's paper at Karlsruhe. Both subsequently wrote textbooks[6,7], which spread the solution throughout the scientific community in the following years. Scientists began correcting equivalent weight values to atomic weights. As a result, elements with similar properties now fell one under another when they were arranged in rows by ascending order of atomic weight, and the periodicity of the elements became clearer.

## EARLY HISTORY

The first theory about the elements was put forth in a pair of anonymous papers by an English physician, William Prout[8], in 1815. He noted that a large number of elements in Dalton's atomic weight list were whole numbers (based on hydrogen = 1). He suggested that the atoms of elements were made up of multiples of the hydrogen atom. Prout's hypothesis generated a great deal of experimental work on atomic weights during the first half of the nineteenth century, as many scientists attempted to verify this speculation. The hypothesis would be revived a century later.

In 1817, Johann Wolfgang Doebereiner, a Bavarian chemist from the University of Jena, noted[9] that the atomic weight values of elements which are closely related to each other in chemical properties are either nearly the same (iron, cobalt and nickel), or else the atomic weight value of the middle of three similar elements is approximately the arithmetic mean of those of the other two similar elements, e.g. the halogen family elements where the mean of the atomic weights of chlorine (35) and iodine (127), i.e. (81), is close to the middle element bromine (80). Dobereiner's *triads* were a first attempt at classification of the chemical elements. He also noted that common elements tend to have small numbers, while uncommon elements have large ones. The Munich Medical-Chemistry Professor Max von Pettenkofer, who is best known for his work in experimental hygiene and epidemiology, suggested[10] in 1850 that among chemically similar elements successive differences in atomic weights amount to either some constant, or to a multiple of some constant. He did not realize that this was essentially the same as the middle of three similar elements being the arithmetic mean of the first and third. Another contributor to this effort was a presenter and one of the secretaries at the Karlsruhe Conference, the English physician and chemist, William Odling. Between 1857 and 1864, Odling arranged the known elements into groups[11] on the basis of similarities in chemical and physical properties. The members of each group were listed in order of their atomic weights. Odling used the valence concept and Gerhardt and Laurent's proportional numbers in his early work and after 1864, Cannizaro's atomic weights. He emphasized the relationship between the maximum valence and periodicity. He did this in spite of the fact that he did not believe in the reality of atoms.



**Dmitri I. Mendeleev: One of a number of discoverers of the periodic law, he is considered the chief architect. The experimental verification of his detailed predictions of new elements and their properties caused the scientific community to take the periodic system seriously.** ***(Photo courtesy of US National Bureau of Standards archives)***

In 1862, the French engineer and geologist, Alexandre Beguyer de Chancourtois, presented a paper[12] on his Telluric Screw, *Vis Tellurique,* which is considered the first symmetric arrangement of the elements. Using a right circular cylinder whose base was divided vertically into sixteen equal parts by lines drawn from the circular base (oxygen was assigned an atomic weight of 16), he coiled a spiral at an angle of 45° around the cylinder. These spirals are similar to the grooves in a screw. Atomic weight values were marked off along the height of the cylinder. Points of intersection of the spiral with the lines drawn from the base were supposed to represent the atomic weights of the elements, which differed from one another by multiples of 16, (16, 32, 48); (Pettenkofer's constant differences). The element tellurium appeared in the center of this Telluric Screw, hence the name. The great similarities existing among elements lying on the same vertical intersections were apparent to de Chancourtois who concluded that 'properties of substances are the properties of numbers'. *This statement is the essence of the Periodic Law.* It is interesting to note that because he was a geologist and not a chemist, his work was completely ignored. Almost 30 years later, other French scientists described what impact his paper might have made on the development of the table, if it had not been ignored.

The final forerunner of the Periodic Table is the one developed by the English chemist, John A. R. Newlands[13], in 1864–1866. He noted that when the elements were placed in order of increasing atomic weights, similarities in chemical and physical properties reappeared with each eighth element. Noting a resemblance to the musical scale, Newlands termed this concept *the law of octaves.* It was received with ridicule when presented to the Chemical Society of London. A member of the audience asked why Newlands didn't arrange the elements alphabetically, since it would make about as much sense. The Chemical Society refused to publish his paper in its proceedings, arguing that it was mere speculation. One must not fail to note with inevitable suspicion that Odling, who had previously published similar work (see preceding), was the scientific secretary of the Society at the time. Neither Newlands' nor de Chancourtois' papers aroused any scientific interest when they were read. Only after Mendeleev's table had become famous, was their work given any attention.

In 1864, Lothar Meyer published[7] his *Modern Theories of Chemistry* in which he included a table of 28 elements based on their valences. It was arranged horizontally so that elements with similar characteristics fell under one another. The elements did occur in increasing order of atomic weight but valence headings predominated. Later, Meyer would relate his inability to arrange all the elements in one table to certain erroneous atomic weight values at that time[14]. In 1868, Meyer prepared a new table of 52 elements for a new edition of his textbook. Unfortunately, this coincided with his move from Neustadt-Eberswalde to the Karlsruhe Polytechnic Institute. This table was passed on to Adolf Remele, his successor at Eberswalde, and forgotten by Meyer until Remele showed it to him in 1893. It was published posthumously[15]. In December 1869, Meyer did present a new table[16] but Mendeleev's table had already been presented and published before that. It is interesting to note that Meyer's tables of 1864 and 1868 list the elements horizontally, while his 1869 table, following Mendeleev, lists the elements vertically. Although Meyer developed his table independently of Mendeleev, he commented that his table was essentially identical to the table of Mendeleev. This certainly weakened his position later. Arguments about priority of discovery arose between Meyer and Mendeleev, which continued until Meyer's death in 1895. In fact, priority claims would eventually be made on behalf of almost all of the early participants, either by the scientists themselves or by their active supporters.

**Lothar Meyer: One of the discoverers of the period law, he is regarded as Mendeleev's chief rival for major claim. His textbook, *Modern Theories of Chemistry* helped to spread knowledge of the usefulness of the period table. *(Photo courtesy of the Gmelin-Institut)***

## THE PERIODIC LAW

Mendeleev's first paper summarizing the conclusions of the Periodic Law was presented to the Russian Chemical Society¶ on 18 March 1869 (6 March on the Julian calendar). Since Mendeleev was inspecting dairies in Tversk province at the time[17], this landmark paper was actually presented by a St. Petersburg University colleague, Nikolai Menschutkin. The published paper[18] contained the following conclusions:

---

¶The Russian Chemical Society had just been formed on 26 October 1868, with Mendeleev as one of the founders. It was renamed the All-Union Mendeleev Chemical Society in 1934.

(1) the elements if arranged according to their atomic weights exhibit an evident periodicity of properties;
(2) elements which are similar in their chemical properties have atomic weights which are either of nearly the same value (e.g. platinum, iridium, osmium) or which increase regularly (e.g. potassium, rubidium, caesium);
(3) the arrangement of the elements or groups of elements in the order of their atomic weights corresponds to their so-called valences as well as, to some extent, to their distinctive chemical properties — as is apparent in other series (lithium, beryllium, boron, carbon, nitrogen, oxygen and iron);
(4) the elements which are most commonly found in nature have small atomic weights;
(5) the magnitude of the atomic weight determines the character of the element just as the magnitude of the molecule determines the character of a compound body;
(6) to expect the discovery of many yet unknown elements, for example, elements analogous to aluminum and silicon, whose atomic weights would be between 65 and 75;
(7) the atomic weight of an element may sometimes be amended by a knowledge of those of the contiguous elements. Thus, the atomic weight of tellurium must lie between 123 and 126, and cannot be 128;
(8) certain characteristic properties of the elements can be deduced from their atomic weights.

The first (vertical) table given by Mendeleev is shown as Fig. 1

Mendeleev's initial effort listed the elements vertically, rather than horizontally, so that it appears strange at first sight when compared to a modern listing. In a second paper that year, presented on 23 August to the 2nd Congress of Russian Naturalists in Moscow[19], Mendeleev had changed to a horizontal listing. The question marks in the table either reserved locations where elements with those atomic weight values had yet to be discovered, or referred to uncertain atomic weight values, or elemental assignments. The symbol Di refers to didymium, a combination of the rare earth elements praseodymium and neodymium which had not yet been separated[20]. It is interesting to see that Doebereiner's *triads* and his *common elements have small numbers*, Meyer's *valences*, and de Chancourtois' statement *properties of substances are the properties of numbers*, are evident in the law, although not mentioned by name. As in all scientific work, Mendeleev built on the work of his predecessors.

Mendeleev further modified his horizontal arrangement at a meeting of the Russian Chemical Society on 3 December 1870 and it assumed the form usually seen today[21]. It was at this meeting that Mendeleev also provided detailed predictions of some undiscovered elements. Mendeleev sensed that chemical behavior was more fundamental than atomic weight and he placed elements in the correct order by using their chemical properties as criteria, even if it meant altering the accepted atomic weights of some elements or inverting the atomic weight order. Note that tellurium has a larger atomic weight value than iodine but its properties imply that it must precede iodine in the Table. Mendeleev correctly inverted these two elements in his Table, although his state-

| | | | | | |
|---|---|---|---|---|---|
| | | | Ti = 50 | Zr = 90 | ? = 180 |
| | | | V = 51 | Nb = 94 | Ta = 182 |
| | | | Cr = 52 | Mo = 96 | W = 186 |
| | | | Mn = 55 | Rh = 104.4 | Pt = 197.4 |
| | | | Fe = 56 | Ru = 104.4 | Ir = 198 |
| | | | Ni = Co = 59 | Pd = 106.6 | Os = 199 |
| H = 1 | | | Cu = 63.4 | Ag = 108 | Hg = 200 |
| | Be = 9.4 | Mg = 24 | Zn = 65.2 | Cd = 112 | |
| | B = 11 | Al = 27.4 | ? = 68 | U = 116 | Au = 197? |
| | C = 12 | Si = 28 | ? = 70 | Sn = 118 | |
| | N = 14 | P = 31 | As = 75 | Sb = 122 | Bi = 210? |
| | O = 16 | S = 32 | Se = 79.4 | Te = 128? | |
| | F = 19 | Cl = 35.5 | Br = 80 | I = 127 | |
| Li = 7 | Na = 23 | K = 39 | Rb = 85.4 | Cs = 133 | Tl = 204 |
| | | Ca = 40 | Sr = 87.6 | Ba = 137 | Pb = 207 |
| | | ? = 45 | Ce = 92 | | |
| | | ?Er = 56 | La = 94 | | |
| | | ?Yt = 60 | Di = 95 | | |
| | | ?In = 75.6 | Th = 118? | | |

**Fig. 1. First Table of the Elements by Mendeleev**

ment number 7 (see preceding) about the tellurium atomic weight being in error was not, in fact, correct. He was the first to deduce the properties of undiscovered elements by using vacancies in the Table and properties of similar elements.

As mentioned earlier, Lothar Meyer published a table[16] in December 1869 which was almost identical with Mendeleev's, although based on physical properties. He included his famous diagram of atomic volumes (the atomic weight of an element divided by its density), which illustrated the principle of periodicity even more clearly than the tabular scheme. Although Mendeleev's March publication[18] might have escaped notice (since the Russian Chemical Society and its journal were new entities), an abstract of his paper was published in the German journal *Z. Chem.*[22], prior to Meyer's December paper. As a result, Mendeleev is usually given more credit than Meyer for the discovery, though Mendeleev based his table on the periodicity of the chemical properties of the elements, while Meyer used physical characteristics.

Both efforts appeared to be for naught. Reflecting on the situation in 1934, the Nobel Prize winning English physicist‖ Ernest Rutherford thought[23] that the fate of Prout's hypothesis had a deterring effect by making many minds critical of generalizations in such a difficult field. Chemists were more interested in adding to the chemical facts than in speculating on relationships between them. In any case, there was little interest in a Periodic Table until the discovery of the elements predicted by Mendeleev. From that point on, the scientific world began to take the Table seriously. This is perhaps the major reason that Mendeleev received more scientific credit than Meyer for the discovery of the Periodic Law. Contrast Mendeleev, who changed atomic weight values based on regularities in the Table, with Meyer, who left the deviations as an incentive to scientists to make new measurements.

Mendeleev's predictions for various chemical elements were verified over the next 15 years with the discovery of gallium (Mendeleev's eka-aluminum) by Paul Lecoq de Boisbaudran[24], of scandium (eka-boron) by Lars Nilson[25], and of germanium (eka-silicon) by Clemens Winkler[26]. Mendeleev used the prefix 'eka' (= *one*, Sanskrit) to indicate an element with similar properties in the next period of the Table. Mendeleev's predicted properties for eka-silicon (made in 1871) are compared with the properties of germanium (discovered in 1886) in Table 1. From this Table, it is easy to

**Table 1. Properties of germanium and eka-silicon**

| Property | Germanium, Winkler (discovered 1886) | Eka-silicon, Mendeleev (predicted 1871) |
|---|---|---|
| Atomic weight | 72.32 | 72 |
| Specific gravity (density) | 5.47 at 20° C | 5.5 |
| Atomic volume | 13.22 cc. | 13 cc. |
| Color | grayish white | dirty gray |
| Specific heat* | 0.076 cal/g. | 0.073 cal/g. |
| Heating in air | white $GeO_2$ | white $EsO_2$ |
| Action on acids | none by HCl | slight with HCl |
| Preparation | $GeO_2$ with C<br>$K_2GeF_6$ with Na | $EsO_2$ with Na<br>$K_2EsF_6$ with Na. |
| Dioxide properties | refractory<br>sp. gr. 4.703<br>mol. vol. 22.16 cc. | refractory<br>sp. gr. 4.7<br>mol. vol. 22 cc |
| Tetrachloride properties | boil. pt. 86° C<br>sp. gr. 1.887<br>mol. vol. 113.35 cc. | boil. pt. $< 100°$ C<br>sp. gr. 1.9<br>mol. vol. 113 cc. |
| Tetraethyl derivative | boil. pt. 160° C<br>sp. gr. less than 1.00 | boil. pt. 160° C<br>sp. gr. 0.96 |

*Specific heat is the energy needed to raise a standard amount of the element by one degree of temperature.

---

‖Rutherford was recognized for his work in atomic transformations with the Nobel Prize in chemistry. This prompted him to quip that the quickest transformation he had ever witnessed was his change from physicist to chemist. Many scientists felt that Rutherford had received just retribution for his previous disparaging remarks about chemistry being a 'lesser' science.

see why scientists were impressed with the remarkable agreement between Mendeleev's predictions and their experimental determination. It would be considered striking in this day and age, but considering the state of knowledge available at that time, this verification is nothing short of spectacular.

## SOME EARLY PROBLEMS WITH THE PERIODIC TABLE

Between 1894 and 1898, the chemically inert noble gases were discovered. Argon was discovered in 1894 by the English physicist, Lord Rayleigh, and the English chemist, William Ramsay[27]. Ramsay[28] discovered helium in 1895, while he and his assistant, Morris Travers, discovered krypton[29], neon[30] and xenon[31] in 1898. Mendeleev had left no vacancy in his Table for these zero valence elements. There had been no experience with monatomic (one atom per molecule) gases before argon was discovered. Although argon had an atomic weight larger than potassium, it would disrupt the periodicity of the Table if located beyond potassium. There were alternative suggestions on the positioning of argon in the Table by either halving or doubling the atomic weight. It was even suggested that gases such as argon, which underwent no chemical reactions might not be elements and should not expect to have a place in the periodic table[32]. Ramsay proposed to consider potassium–argon in the same category as the tellurium–iodine atomic weight inversion[33]. Finally, in 1901, Ramsay and Travers[34] proposed a new element group for the noble gases, between the halogens and the alkali metals.

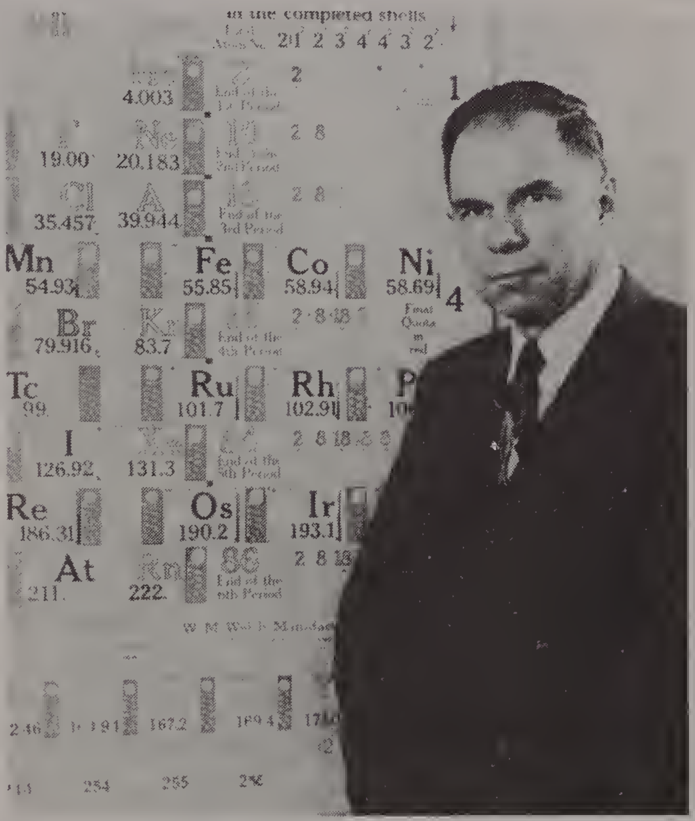
Another problem area was the positioning of the rare earth elements. The so-called lanthanide series was not initially separated from the rest of the Periodic Table. Fortunately, at the time that the original Table was proposed, many of these rare earth elements had not yet been discovered and those that were known to exist did not have accurately determined atomic weights or properties. In some of the early tables, the rare earth elements were not included since their placement in the Table would be uncertain at best. In any case, they were a series of elements which had properties and atomic weight values similar to one another but which did not follow the regularities of the Table. After success with five rows of elements, why should we suddenly have this problem in the sixth row? It has been conjectured that if their existence had been known at the time, it might have set back the discovery of the Table. As more of the rare earth elements were discovered, it became evident that they would not fit within the then-current Table. Eventually, they were placed in a separate area below the main Table. Even after the English physicist Henry G. J. Moseley's introduction of the atomic number (nuclear charge) of the element as the correct parameter rather than the atomic weight[35], there was no satisfactory solution until the Danish physicist, Niels Bohr, proposed his electronic orbital structure[36] of the atom (see following). There was speculation as to where this rare earth series should begin, since promethium (element 61), and hafnium (element 72) were not known at the time of Bohr's work. This made it difficult to resolve their position since the total number of elements involved was unclear. It is interesting to note that in 1922 Bohr used his theory to help discover an element. In 1911, a French chemist, George Urbain, had claimed[37] discovery of celtium (element 72), with properties similar to the rare earth elements. Bohr knew his theory required element 72 to have properties similar to zirconium (element 40) and not the rare earths. He recommended to scientists working at his institute in Copenhagen that they search for this element in zirconium ores and hafnium was discovered[38]. Celtium was later shown to be a mixture of some other rare earth elements.

**Niels Bohr: His electronic theory of the atom explained why the periodic table worked and indicated why the rare earth elements would not fit in the main table. *(Photo courtesy of A.I.P. Niels Bohr Library)***

The other rare earth series, the actinide elements, provided still another puzzle for placement in the Periodic Table, when the transuranium elements (elements > 92) were discovered during the 1940s. In developing his theory, Bohr had predicted that these elements would be even more difficult to place than the lanthanides. In the Table of 40 years ago, the heaviest natural elements, actinium, thorium, protactinium, and uranium had been placed in the seventh row of the main Table in positions corresponding to the sixth row transition elements, lanthanum, hafnium, tantalum, and tungsten because of somewhat similar properties. Before the transuranium elements were even discovered, a question arose as to their eventual placement in the Table and where the new rare earth series should start. Speculation for the start of the series[39] ranged from actinium (element 89) up to element 99. Using evidence on the first few transuranium elements which had been discovered (chemical properties, spectroscopic data, crystallographic structure and magnetic susceptibility data), the American chemist Glenn Seaborg[40] suggested the answer. He was the leader of the group discovering these new elements and thought that the new rare earth series should begin with actinium and end with element 103. Thus element 104 should have properties similar to hafnium.

Another questionable area within the Table has been the transition elements and the subgroups. The early attempts at a periodic classification had the first few rows (periods) of the Table as short periods containing seven elements, *Newlands' law of octaves*, which showed a fairly regular change in properties as one moved across the row, e.g. the valence. The next row had ten elements. Seven of these corresponded to the short period elements, although in this case they could exhibit a variable valence depending on the compound they were in. However, the final three of these ten elements had similar atomic weights and properties and were often treated together as a single group called the transition metals, cf. *Doebereiner's triads* (Fe, Co, Ni). Some authors discussed the Table in terms of subgroups. They referred to the short period elements as the 'characteristic' or 'main' group and the other elements in the long period containing the transition metals as the 'minor subgroup' or 'transition' group. With the advent of Bohr's theory, the distinction between these two groups became clear. In recent years, the notation of the main and transition elements has become confused and this confusion has led to a new proposal for their notation (see later).

The final problem area involves the discovery of radioactivity at the end of the nineteenth century. A number of new elements were discovered, and some of their radioactive isotopes were mistaken for elements prior to a more complete understanding. One result of all the discoveries was the existence of a very large number of apparently 'new' elements which needed to be placed somewhere. This might affect the periodicity of the Table. The work of Moseley, Bohr and the English chemist Frederick Soddy would help to clarify the situation.



**Glen T. Seaborg: He used the properties of the transuranium elements he discovered to fit this new rare earth series into the periodic table properly. Recent experiments have proved his predictions to be correct.** ***(Photo courtesy of the University of California)***

## A NEW CLASSIFICATION AND SOME PROBLEMS SOLVED

1913 was a very significant year for the Periodic Law. Because of all the radioactive measurements, there were many substances being found with various atomic weight values. Soddy[41] had previously shown the chemical identity of mesothorium ($^{228}$Ra) and radium and remarked that it completely negated the attempt to bring the radio-elements into the periodic table. The Polish chemist from Karlsruhe, Kasimir Fajans, began the year by proposing that more than one atomic weight value could belong to a single location in the Table[42]. Immediately following this, Soddy[43] concluded that there were chemical elements with different radioactive properties and different atomic weights but with the same chemical properties and therefore occupying the same position in the Table. He coined the word 'isotope' (*in the same place*, Gr) to account for these radioactive species. This concept of the same element having different atomic weights resurrected Prout's hypothesis in a slightly different form. The atomic weights of the isotopes would be the whole number multiples of the atomic weight of hydrogen. Thus, the new radioactive species did not require separate places in the Table and the periodicity of the Table was not disturbed.

When a chemical element is excited, either by heating or with an electric spark, it emits radiation characteristic of the element**, which can be recorded by spectrometer. Conversely, a spectrum can be used to determine the elemental components of a sample. This radiation can appear in the X-ray region as well as in the visible range. Late in 1913, Moseley[35] compared the energy of the X-ray spectral lines of various elements against their atomic weight and obtained approximately a straight line graph. To avoid breaks in this graph, he found it necessary to place argon–potassium, cobalt–nickel, and tellurium–iodine in the order demanded by chemical properties rather than increasing atomic weight. According to his curve of X-ray lines, every element has a constant value, its 'ordinal' or 'atomic' number, which increases by a constant amount from element to element. This atomic number was the number of protons in the nucleus of each element. This provided experimental confirmation to an earlier speculation of Antonius van der Broek[44], a Dutch lawyer and amateur scientist††, that the intra-atomic charge of an element (not the atomic weight) determines its location in the table. With his X-ray analysis, Moseley could determine elemental composition of a sample in a matter of hours. Urbain, who had spent a lifetime measuring rare earth elements, commented that Moseley, from these data, could draw conclusions in a few days that he himself had spent 20 years of research trying to discover. Thus, the use of the atomic number for classification in the Table eliminated the problem of atomic weight inversion that had plagued workers trying to arrange ordered pairs of elements to fit their chemical properties. (Unfortunately, Moseley never lived to receive the scientific acclaim due him. At the outbreak of World War I, he volunteered for service and died in the ill-fated invasion at Gallipoli at the age of 27. As a result of his death, a major effort was made to ensure that scientific talent would be better utilized by governments in the future.)

In addition to these X-rays, much of an element's characteristic radiation is in the visible and ultraviolet portions of the spectrum. Each element's spectral lines can be separated into lines belonging to various series. Four of the identified series are the *sharp*, *principal, diffuse* and *fundamental* series, which correspond to the sharpest lines, the brightest lines and the most diffuse lines in the spectra and to a series which is not in the visible region, respectively. Bohr used this spectroscopic information in arriving at his theory of the atom.

## BOHR'S THEORY OF THE STRUCTURE OF THE ATOM

1913 also marked the advent of Bohr's theory of the atom[45]. He saw the atom as a miniature solar system with planetary electrons orbiting about a heavy nucleus. According to Bohr's theory, of the infinite number of orbits that an electron might have, only certain orbits actually occur. The orbits were determined by limiting the electron's angular momentum‡‡ (symbol $l$) to whole numbers. Bohr's second statement was that an electron can 'jump' from one 'quantum' orbit (state) in that element to another. This occurs when energy is added to or subtracted from the atom, thus producing the element's spectral radiation. In the scientific literature, these orbits are often referred to as 'shells'. When it was determined that the transitions involving electrons in an orbit with an angular momentum of zero ($l = 0$) were responsible for the sharp series, these electrons were referred to as *s* electrons. Similarly ($l = 1$) electrons were called *p* electrons since their transitions caused the principal series; likewise with the ($l = 2$) *d* electrons: diffuse series, and the ($l = 3$) *f* electrons: fundamental series. Each of the atom's allowed orbits has a maximum of two of the *s* electrons, six of the *p* electrons, ten of the *d* electrons, and fourteen of the *f* electrons. The first orbit closest to the central nucleus contains only *s* electrons, the second orbit out from the

---

**At the International Congress in 1900 at Paris, it was agreed that no new element should be accepted until its spark spectrum was identified and shown to be different from all other elements.

††Rutherford expressed considerable annoyance that a layman should publish, "a lot of guesses for fun without sufficient foundation".

‡‡The angular momentum of a particle moving in a circle at a distance $r$ from the center is the product $(m)(v)(r)$, where $m$ is the mass and $v$ is the velocity (speed) of the particle.

**Harry G. J. Moseley: His study of the X-ray spectra of elements verified that the atomic number and not the atomic weight was the basic parameter of the table. This discovery eliminated the atomic weight inversion problem and enabled scientists to determine the number of elements available.** ***(Photo courtesy of A.I.P. Niels Bohr Library)***

nucleus contains both *s* and *p* electrons, the third — *s, p,* and *d* electrons and the fourth and outer orbits — *s, p, d* and *f* electrons.

The first row of the Periodic Table is filled with elements (hydrogen and helium) having the 1–*s* electrons, (one and two respectively). Elements in the second row are those with 2–*s* electrons (lithium and beryllium) and then those with 2–*p* electrons (boron through neon). Similarly, the third row contains elements whose outermost orbit is filled with the 3–*s* electrons and then the 3–*p* electrons. In the fourth row, where the outermost orbit of the atom contains two 4–*s* electrons (calcium), the 3–*d* electrons are added to an inner orbit (scandium through zinc) and then the 4–*p* electrons are added to the outermost orbit again (gallium through krypton). When you reach the sixth and seventh row, after two appropriate *s* electrons are added, the 4–*f* and 5–*f* electrons begin to fill the inner orbit, respectively. This corresponds to the two rare earth series, the lanthanides and the actinides. Note that an outer orbit which is completely filled with *s* and *p* electrons is apparently a very stable configuration, since those elements are the noble gases (helium, neon, argon, krypton, xenon and radon), which will not readily combine with any of the other 'common' elements. The electrons in the outermost and the penultimate orbits are called *valence electrons* since generally their actions account for the valence of the element, i.e. electrons capable of taking part in the links between atoms. Chemical behavior depends on the valence electrons so that when the only change between adjacent elements in the table is in the number of inner shell electrons, there is not much difference in chemical properties between the elements. This would explain why the various lanthanide and actinide elements have similar properties.

The most commonly seen Periodic Table has 18 columns corresponding to the 2–*s*, 10–*d* and 6–*p* electron positions. Thus, those elements in which the *f* orbit is filled (rare earths) obviously will not fit into this Table. Although the 18 column table is standard, there have been an extremely large number of variations tried to improve on the presentation of the information. There have been short, long, spiral, pyramid and pretzel shapes, as well as many other assorted shapes and sizes devised in the last 115 years for these tables.

## RECENT DEVELOPMENTS IN THE PERIODIC TABLE

In the past 20 years, claims of the discovery of many new elements have been made. Unlike earlier times when elements were *discovered* in nature, these new elements are *synthesized* in highly specialized laboratories with very expensive equipment. There are, at present, only three laboratories in the world with the facilities and the funds to do these experiments. Since a discoverer has always had the right to propose a name for a new element, a problem has now arisen. There are conflicting claims from two of these laboratories about which one initially made elements containing 104 and 105 protons. Each claimant has proposed a set of names for these elements. As a result, until these conflicting claims are resolved, no trivial names can be internationally agreed upon but these transactinide elements can be referred to by their IUPAC systematic names.

Normally, chemical experiments are performed with an amount of an element equivalent to at least a million-million atoms, i.e. $(10)^{12}$ atoms, or more. Experiments to confirm the properties of the transactinide elements have been performed with only ten to twenty atoms because these atoms are hard to produce and have very short lifetimes (1 min or less), which introduces extreme difficulties. It appears that elements 104 and 105 are the *d* electron transition elements eka-hafnium[46] and eka-tantalum[47], respectively, on the basis of some similar chemical properties. Thus, Seaborg's actinide concept is justified as the correct placement for this second rare earth series. For elements 106 to 109, there are even fewer atoms available and even shorter lifetimes than those of 104 and 105. No chemical experiments have yet been performed on isotopes of these elements. However, they are expected to fill out the seventh row of transition elements.

On a standard Periodic Table, it is clear that metals form most of the elements in the table, while non-metals are restricted to the upper right hand corner (the *p* shell elements). In 1927, the Austrian born chemical-physicist from the Catholic University of America, Karl F. Herzfeld[48] defined a criterion for determining when an element will show metallic properties. He related the onset of metallic behavior to the ratio of refractivity§§ to volume. When this ratio is one or larger, the valence electrons are free to move and the element becomes conductive, or a metal. Recently, efforts have been made[49] to use Herzfeld's criterion to examine elements of the periodic table lying between the metals and the non-metals, the so called semi-conductors. These elements are found along the diagonal through the *p* shell portion of the Table, e.g. germanium, arsenic, tellurium. The object is to determine under what physical conditions, (e.g. temperature and pressure), the semi-conducting elements can be made to exhibit metallic properties.

We have seen that the main group elements in the Table are the two *s* electron elements and the six *p* electron elements. The transition group elements are the ten *d* electron elements. Unfortunately, over the years some authors have referred to elements of these two groups with the heading designation *a* and *b*, while other authors have used the inverse notation *b* and *a*. If an author refers to the 4*b* elements, for example, and an individual element is not identified, one is never completely sure which group of elements is actually meant, titanium-like or carbon-like elements. To correct this awkward situation, an attempt is being made to produce an entirely new designation for the headings of the various groups of elements in the Table. The American Chemical Society[50] has recently published an 18 group notation, 1–18, for the two *s*, the ten *d* and the six *p* electron elements, with a 'd' designation added for groups 3 through 12, i.e. 1, 2, 3d, 4d,..., 11d, 12d, 13, 14, etc. The fourteen *f* electron elements of the lanthanide and actinide series are unnumbered and given their usual location in separate rows at the bottom of the Table. Some authors suggested adding the *s, p,* and *f* notation to the appropriate group headings also. Other authors have suggested retaining the M (main) and T (transition) notation in the headings.

What are the advantages and disadvantages to all these proposals? The spectroscopic notation could be easily added to the group number and serve as a quick reminder of which electron orbits are being filled for that element. Noting the 'd' at the head of the group would tell the reader that inner orbit electrons are being added and the properties have less dramatic changes. On the other hand, much of the present confusion about the *a* and *b* notation pertains to which is considered the main and which the transition group and the M and T notation might just revive that confusion.

From the foregoing discussion, readers may conclude that they have learned everything they ever wanted to know (or possibly more!) about the structure of the atom and how the elements are built up. To strike a discordant note at the end, readers should be cautioned that the question of which electron is added to each orbit is an oversimplification. The Bohr theory was constructed in an attempt to explain the facts, but like any theory it is not the final truth. The electron is added to the orbit which involves the least energy. Thus, there are places in the Table where an element's structure is slightly different from that indicated here. As a result, the arguments by analogy¶¶ which have been used are not always accurate. Recent work on the study of the two rare earth series indicate that they are not necessarily similar element by element, but that there is a similarity between the first few lanthanides and the last half of the actinides in terms of their valence states[51]. Only time will tell if continued research into the properties of the elements will produce further changes in this Periodic Table.

---

§§The refractivity of an element is related to the ratio of the speed of light in a vacuum to the speed of light in that element.

## MENDELEEV AND THE AFTERMATH OF THE TABLE

Following the publication of the Table, Mendeleev continued to revise his system on the basis of the latest data. The discoveries of his predicted elements caused the scientific world to take these speculations seriously. Lecoq de Boisbaudran, who had been unaware of Mendeleev, initially determined the density of gallium to be 4.7 compared to Mendeleev's prediction of 5.9. Mendeleev insisted that gallium was eka-aluminum[52]. A redetermination by Boisbaudran[53] gave a value of 5.956, confirming Mendeleev's theory. Scientists were extremely impressed that Mendeleev could know more about a new element from theory than the discoverer of that element could from his experiment.

The scientific community bestowed many honors on Mendeleev as a result of his work on the periodic table. In 1882, both Mendeleev and Meyer shared in the Davy Medal; in 1889, Mendeleev received the Faraday Medal and gave the Faraday lecture and in 1905, he received the Copley Medal. He was elected an honorary member of some twenty foreign scientific institutions. Although he held honorary membership in the various foreign societies, it is interesting to note that Mendeleev was defeated in an election for membership in the Imperial Russian Academy of Sciences, at St. Petersburg. In the 1870s, there was much controversy about classical vs scientific education. In his Rector's address at Munich, Pettenkofer had commented that 65% of a student's time was spent on languages (Latin, Greek, French and German). Mendeleev argued for science and against 'dead languages'. As an adviser to the Minister of Education, Count Dmitri Tolstoi who later became a reactionary Minister of the Interior, Mendeleev openly opposed Tolstoi's reform of 1871, which eliminated science education in favor of a strictly classical education in gymnasia. In retaliation, Tolstoi, who had much influence in the Academy‖‖, worked to defeat Mendeleev's election bid for ordinary membership in 1880. Another instance of Mendeleev's liberal views being costly to his career occurred in 1890. He calmed the student unrest at St. Petersburg University by agreeing to present the student's petition to the Minister of Public Education. He received an insulting reprimand for not minding his own business, whereupon he resigned his professorship. No doubt his opposition to the classical system of education did not help his cause. Subsequently in 1893, Mendeleev was appointed Director of the Central Board of Weights and Measures***. Under his direction, the Russian standards of measure were compared with the English and metric standards.

Mendeleev was initially sceptical about the discovery of the noble gases, argon and helium. However, with the discovery of their analogues and the proposed zero valence group, Mendeleev accepted the new elements and termed Ramsay a 'reinforcer of the periodic law'. He also did not accept radioactive transformations and unfortunately did not live to witness the solution via Soddy's isotope concept.

## CONCLUSION

The periodic classification of the elements has had an interesting history, which is closely tied to the history of chemistry itself. Considering the situation 100–150 years ago, it can easily be seen that laboratory facilities at that time did not compare with today's. The system was developed by scientists in an era which was ignorant not only of the atom's electronic structure, but even of the existence of the electron. They had neither modern electronic or solid state instrumentation nor highly developed methods for separation and purification. It is truly amazing that Mendeleev, Meyer and the others were able to deduce as much as they did about the nature of the Periodic Law. It was laboriously erected, one step at a time, using the data developed by their predecessors. Although

---

¶¶Sir Humphry Davy once said, analogy is the fruitful parent of error!

‖‖In spite of his attitude toward science, Tolstoi was elected President of the Academy of Sciences in 1882.

***Now called the Mendeleev All-Union Scientific Research Institute of Metrology.

Mendeleev deserves maximal credit for his discovery of and confidence in the periodic system from which he drew his conclusions, many other scientists deserve credit for the eventual system. Perhaps the next time that you encounter a periodic chart hanging in a scientific lecture room or laboratory, you will approach it with the well-merited awe it deserves. It is the result of a historic battleground of ideas sometimes following, sometimes anticipating, experimental observations on the materials in nature.

## REFERENCES

1. J. Dalton, On the absorption of gases by water and other liquids. *Mem. Proc. Manchr. lit. phil. Soc.* **1,** 271 (1805).
2. J. Dalton, *New System of Chemical Philosophy* (London, Pt. 1, 1808; Pt. 2, 1810; Vol. II, Pt. 1, 1827; 2nd ed., Pt. 1, 1842).
3. A. Avogadro, Essai d'une maniere de determiner les masses relatives des molecules elementaires des corps, et les proportions selon lesquelles elles entrent dans ces combinaisons. *J. de Physique* **73,** 58 (1811); *Alembic Club Reprints* — No. 4, p. 28 Livingstone, Edinburgh (1950).
4. J. L. Gay-Lussac, Memoire sur la combinaison des sunstances gazeuses, les unes avec les autres. *Memoires de physique et de chimie de la Societe d'Arcueil* **2,** 207 (1809); *Alembic Club Reprints* — No. 4, p. 8 Livingstone, Edinburgh (1950).
5. S. Cannizaro, Sunto di un corso di filosofia Chimica. *Nuovo Cim.* **7,** 321 (1858); *Alembic Club Reprints* — 18, Livingstone, Edinburgh (1947).
6. D. I. Mendeleev, *Principles of Chemistry.* St. Petersburg (1868–1871); later editions (1872–1873), (1877), (1881–1882), (1889), (1895), (1903), and (1906).
7. J. L. Meyer, *Die modernen Theorien der Chemie und ihre Bedeutung fur die chemische Statik.* Breslau (1864); later editions (1872), (1876), (1883), and (1884).
8. Anonymous (attributed to W. Prout), On the relation between specific gravities of bodies in their gaseous state and the weights of their atoms. *T. Thompson's Ann. Phil.* **6,** 321 (1815); Corrections of a mistake in the essay on the relationship between the specific gravities of bodies in their gaseous states and the weights of their atoms. *Ibid.* **7,** 111 (1816).
9. J. W. Doebereiner, Auszug eines briefes vom Hofrath Wurzer, Prof der Chemie eu Marburg. Chemie eu Marburg. *(Gilbert's) Annalen der Physik* **56,** 331 (1817); Aus einem schreiben des Herrn Prof und Bergrath Doebereiner an den Prof Gilbert. *(Gilbert's) Annalen der Physik* **57,** 435 (1817); Versuch zu einer gruppirung der elementaren stoffe nach ihrer analogie. *Ann. Physik (Pogg.)* **15,** 301 (1829).
10. M. Pettenkofer, Uber die regelmassigen abstande der aequivalentzahlen der sogenannten einfachen radicalen. *Munchener Gelehrten Anziegen,* **30,** 261 (1850); *Ann. Chem. (Liebig)* **105,** 187 (1858).
11. W. Odling, On the natural groupings of the elements. *Phil. Mag.* [4] **13,** 423 and 480 (1857); On the proportional numbers of the elements. *Q. J. Sci.,* **1,** 642 (1864); Metals, atomic weights and classification of the elements. *Dictionary of Chemistry and Allied Branches of Other Sciences,* ed. Henry Watts (London: Longmans, Green) III, 757 (1865).
12. A. B. de Chancourtois, Memoire sur un classement naturel des corps simples on radicaux appele vis tellurique. *Compt. Rend. (Paris)* **54,** 757 (1862).
13. J. A. R. Newlands, On relations among the Equivalents. *Chem. News J. Phys. Sci.* **10,** 94 (Aug. 20) (1864).
14. L. Meyer, Zur geschichte der periodischen atomistik. *Ber. d. chem. Ges.* **13,** 259 (1880).
15. K. Seubert, Zur geschichte des periodischen Systems. *Z. anorg. Chem.* **9,** 334 (1895).
16. L. Meyer, Die Natur der chemischen Elemente als Function ihrer Atomgewichte. *(Liebig's) Ann. Chem. u. Pharm. supp.* **7,** 354 (1870).
17. D. I. Mendeleev, On the question of cheese manufacturing in Artells. *Trans. Roy. Free Econom. Soc.* 2, 3, and 4 (1869).
18. D. I. Mendeleev, The relationships between the properties of elements and their atomic weights. *J. Russ. Chem. Soc.* **1,** 60 (1869).
19. D. I. Mendeleev, On the atomic volume of simple bodies. *Trans. 2nd Congress Russ. Arts Sci.,* p. 62 (1869).
20. C. Auer von Welsbach, Die Zerlegung des Didyms in seine Elemente. *Ber. d. chem. Ges.* **18,** 605 (1885).
21. D. I. Mendeleev, The natural system of the elements and its application to indicate the properties of undiscovered elements. *J. Russ. Chem. Soc.* **3,** 25 (1871).
22. D. I. Mendeleev, Uber die Beziehungen der Eigenschaften zu den Atomgewichten der Elemente. *Z. Chem.* **5,** 405 (1869).
23. E. Rutherford, The periodic law and its interpretation. *J. Chem. Soc.* Pt. 1, 635 (1934).
24. M. Lecoq de Boisbaudran, Caracteres chimiques et spectroscopiques d'un nouveau metal, le gallium, decouvert dans une blende de la mine de pierrefitte, vallee d'argeles (pyrenees). *Compt. Rend. (Paris)* **81,** 493 (1875); Sur quelques proprietes du gallium. *Compt. Rend. (Paris)* **81,** 1100 (1875).
25. L. F. Nilson, Sur le scandium element nouveau. *Compt. Rend. (Paris)* **88,** 645 (1879); Sur le poids atomique et sur quelques sels caracteristiques du scandium. *Compt. Rend. (Paris)* **91,** 118 (1880).
26. C. Winkler, Germanium, Ge, ein neues nicht-metallisches Element. *Ber. d. chem. Ges.* **19,** 210 (1886); Mittheilungen uber das Germanium. *J. Prakt. Chem.* [2] **34,** 177 (1886).
27. Lord Rayleigh and W. Ramsay, Argon, a new constituent of the atmosphere. *Phil. Trans. Roy. Soc. Lond.* **A186,** 182 (1895).

28. W. Ramsay, Helium, a gaseous constituent of certain minerals. Part I, *Proc. Roy. Soc. Lond.* A**58,** 81 (1895).
29. W. Ramsay and M. W. Travers, On a new constituent of atmospheric air. *Proc. Roy. Soc.* A**63,** 405 (1898).
30. W. Ramsay and M. W. Travers, On the companions of argon. *Proc. Roy. Soc.* A**63,** 437 (1898).
31. W. Ramsay and M. W. Travers, On the extraction from air of the companions of argon and on neon. *Br. Assoc. Adv. Sci. Rep.* 828 (1898).
34. A. Piccini, Das periodische System der Elemente von Mendelejeff und die neuen Bestandteile der atmospharischen Luft. *Z. anorg. Chem.* **19,** 295 (1899).
32. W. Ramsay, An undiscovered gas. *Nature* **56,** 379 (1897).
33. W. Ramsay and M. W. Travers, Argon and its companions. *Phil. Trans. Roy. Soc. Lond.* A**197,** 47 (1901).
35. H. G. J. Moseley, The high frequency spectra of the elements. *Phil. Mag.* **26,** 1024 (1913); The high frequency spectra of the elements II. *Phil. Mag.* **27,** 703 (1914).
36. N. Bohr, Atomic structure. *Nature* **107,** 104 (1921).
37. G. Urbain, Sur un nouvel element qui accompagne le lutecium et le scandium dans les terres de la gadolinite: le celtium. *Compt. Rend. (Paris)* **152,** 141 (1911).
38. D. Coster and G. Hevesy, On the missing element of atomic number 72. *Nature* **111,** 79 (1923).
39. G. T. Seaborg, Place in periodic system and electronic structure of the heaviest elements. *Nucleonics* **5** (5), 16 (1949).
40. G. T. Seaborg, The transuranium elements. *Science* **104,** 379 (1946).
41. F. Soddy, The chemistry of mesothorium. *J. Chem. Soc.* **99,** 72 (1911).
42. K. Fajans, Uber eine Beziehung zwischen der Art einer radioaktiven Umwandlung und dem elektrochemischen Verhalten der betreffenden Radioelemente. *Phys. Z.* **14,** 131 (1913); Die Stellung der Radioelemente im periodischen System. *Phys. Z.* **14,** 136 (1913).
43. F. Soddy, Intra-atomic charge. *Nature* **92,** 399 (1913).
44. A. van der Broek, The number of possible elements and Mendeleev's 'cubic' periodic system. *Nature* **87,** 78 (1911). Intra-atomic charge. *Nature* **92,** 372 (1913).
45. N. Bohr, On the constitution of atoms and molecules, I. *Phil. Mag.* [6] **26,** 1 (1913); On the constitution of atoms and molecules, II — Systems containing only a single nucleus. *Phil. Mag.* [6] **26,** 476 (1913); On the constitution of atoms and molecules, III — Systems containing several nuclei. *Phil. Mag.* [6] **26,** 857 (1913).
46. R. Silva, J. Harris, M. Nurmia, K. Eskola and A. Ghiorso, Chemical separation of rutherfordium. *Inorg. Nucl. Chem. Lett.* **6,** 871 (1970); I. Zvara, V. Z. Belov, L. P. Chelnokov, V. P. Domanov, M. Hussonois, Yu. S. Korotkin, V. A. Schegolev and M. R. Shalayevsky, Chemical separation of kurchatovium. *Inorg. Nucl. Chem. Lett.* **7,** 1109 (1971); E. K. Hulet, R. W. Lougheed, J. F. Wild, J. H. Landrum, J. M. Nitschke and A. Ghiorso, Chloride complexation of element 104. *J. Inorg. Nucl. Chem.* **42,** 79 (1980).
47. I. Zvara, V. Z. Belov, V. P. Domanov and M. R. Shalaevskii, Chemical isolation of nilsbohrium as ekatantalum in the form of the anhydrous bromide — II. Experiments with a spontaneously fissioning isotope of nilsbohrium. *Radiokhimiya* **18,** 371 (1976).
48. K. F. Herzfeld, On atomic properties which make an element a metal. *Phys. Rev.* **29,** 701 (1927).
49. P. P. Edwards and M. J. Sienko, The transition to the metallic state. *Acc. Chem. Res.* **15,** 87 (1982).
50. K. L. Loening, Recommended format for the periodic table of the elements. *J. Chem. Ed.* **61,** 136 (1984).
51. G. V. Ionova, The problem of unusual valence states of the f-elements in connection with the periodic law of D. I. Mendeleev. *Radiokhimiya* **24,** 457 (1982); N. B. Mikheev, Lower oxidation states of actinides. *Radiochim. Acta* **32,** 69 (1983).
52. D. I. Mendeleev, Remarques a propos de la decouverte du gallium. *Compt. Rend. (Paris)* **81,** 972 (1875).
53. M. Lecoq de Boisbaudran, Sur les proprietes physiques du gallium. *Compt. Rend. (Paris)* **83,** 611 (1876).

---

## ICSU Committee on Space Research (COSPAR)

The 25th Plenary Meeting of COSPAR took place in Graz, Austria, 25 June – 7 July 1984. During this time, as well as business meetings of COSPAR Commissions, Subcommissions and Panels and of the Bureau and Executive Council, there were no less than 9 Specialized Symposia, 15 Specialized Workshops and 21 meetings of Interdisciplinary Scientific Commissions and Panels. The Proceedings will be published in Vols. 4 and 5 of the COSPAR Journal *Advances in Space Research*. At an Open Plenary Meeting the first COSPAR Award for Outstanding Contribution to Space Science was presented to Prof. J. A. van Allen and the first COSPAR International Cooperation Medal for Distinguished Contribution to Promotion of International Cooperation in Space Science to Academician R. Z. Sagdeev.

## Asian Chemical Conference 1985

The Conference is being organized for the Federation of Asian Chemical Societies and is to be held at the National University of Singapore, 8–11 April 1985. It aims to highlight advances made in the practice of analytical chemistry, in microprocessor-based control of instruments, in computers in chemistry and in chemical education. Immediately following the Conference a Workshop on Microprocessors and Microcomputers will be held (12–17 April 1985); this will include a comprehensive lecture programme and hands-on laboratory experience. The official language of both the Conference and the Workshop will be English.

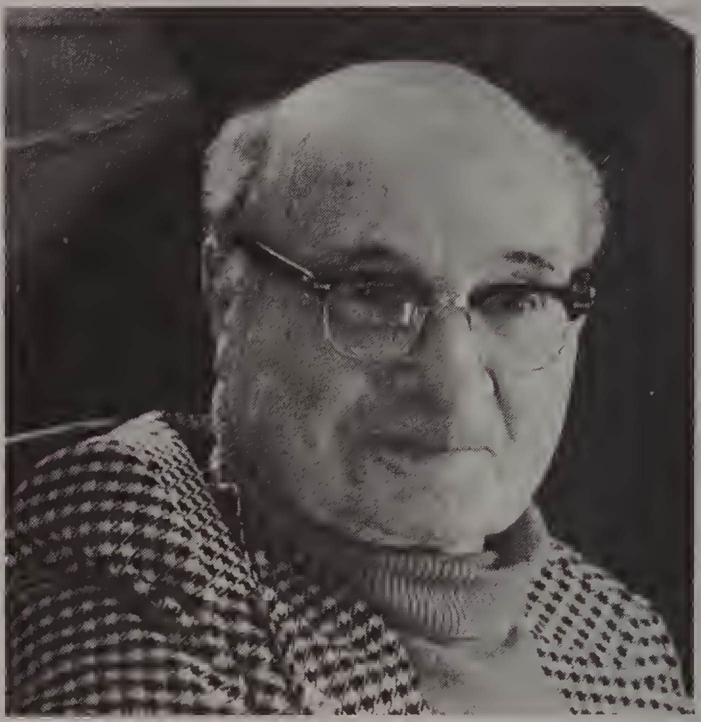
Further information may be obtained from the Secretary, Organizing Committee, Asian Chemical Conference 1985, c/o Department of Chemistry, National University of Singapore, Kent Ridge, Singapore 0511.

# Prof. I. M. Kolthoff — a 90th anniversary

Izaak Maurits ('Piet') Kolthoff, born in Almelo, Netherlands, on 11 February 1894, needs no introduction to analytical chemists in general and, in particular, to former colleagues in the Analytical Chemistry Division of IUPAC. Having been in both these categories, it gives me the greatest pleasure to use Editor's privilege in order to record his 90th birthday in CI, even if belatedly. If, by doing so, I am setting a precedent it is a good one — reserved for those who achieve their 90th birthday, have been President of an IUPAC Division and have served on a Division Committee with the editor of CI.

I. M. Kolthoff studied under Prof. Schoorl at the University of Utrecht and gained a diploma as Pharmacist but, more importantly, received a thorough groundwork in analytical chemistry. His Ph.D. was awarded in 1918 and he remained with Prof. Schoorl until 1927, when he moved to the University of Minnesota as chief of the Division of Analytical Chemistry. So started one of the greatest success stories of the theory, practice and teaching of analytical chemistry. A summary of Kolthoff's contributions to the literature appeared in the February 1984 issue of *Analytical Chemistry*, but this may already be out of date — he has been publishing papers at an average rate of about six *per annum* since he "retired" in 1962. A "family tree" of graduate students, including the 51 Ph.D.s who studied directly under Kolthoff, contains 1073 Ph.D. names.

Prof. Kolthoff's membership of the Analytical Chemistry Division of IUPAC extended over at least 24 years. He was Vice-President 1951–1953, President 1953–1957 and Past-President 1957–1959; he was re-elected on to the Division Committee in 1971 for a 4-year period. In the interval he had spent 2 years (1959–1961) as an Associate Member of Commission V.3 and was then elected a Titular Member of Commission V.5, becoming Chairman in 1963. In 1965 he was re-elected as a Titular Member, serving a second term as Chairman 1967 to 1969. That is as far as the Division's records, immediately available to me, go. However, I can't help feeling that he must have been around when the Division was formed in 1949!



Prof. I. M. Kolthoff

I am indebted to Maureen Smith, Editor, for allowing me to use information in an article in the University of Minnesota *Record* and for the photographs by Tom Foley.

**R. W. Fennell**

## IUPAC PEOPLE

**We congratulate:**

**Dr. J. R. Bull** (Nat. Rep., Commission III.1) on the award of the Gold Medal of the South African Chemical Institute "for exceptional achievement in research in chemistry as adjudged by published work".

**Prof. L. Kosta** (formerly Commission V.7) on his election as President of the Union of Yugoslav Chemical Societies.

**We regret to record the death of:**

**Dr. P. R. Gendron,** Canada (16 February 1984) — Bureau (1969–1973).

# Professional Workers and Trade Unions

*This is an 'interface paper', produced in October 1983, by the Working Party on Professional Affairs (WPPA) of the Federation of European Chemical Societies (FECS). The Working Party first met in October 1973 and has met twice yearly since then. It concerns itself mainly with four subject areas — health and safety; the image of chemists and chemistry (coupled with the status of chemists and relationships with government); in-service training; and manpower statistics. The present Chairman is Dr. J.-J. Salzmann, Switzerland.*

## PREFACE

*A professional chemist with legal responsibility to carry out analyses on foodstuffs sold by a supermarket is called upon to act following a 'scare' that bottled fruit juice may be being tampered with, by the introduction of poison. The professional chemist is a member of a trade union which at the time of the scare is on strike. If he carries out the analysis he can be dismissed from his job.*

*A professional gas engineer, with specified responsibility to provide emergency cover and to ensure the safety of the general public, is told by his employer to attend work during a strike. The professional gas engineer is a member of a trade union. After the strike ends, charges are brought against him by his union on the grounds of his reporting for work during an official strike in direct defiance of a union instruction. The local committee of the union decides to expel him from the union.*

*The events related above in the case of the professional chemist could have happened; in the case of the professional gas engineer they in fact did happen.*

## SUMMARY

This paper examines the dilemma that can face professional chemists who have responsibilities to their professional bodies and duties to trade unions of which they may be members.

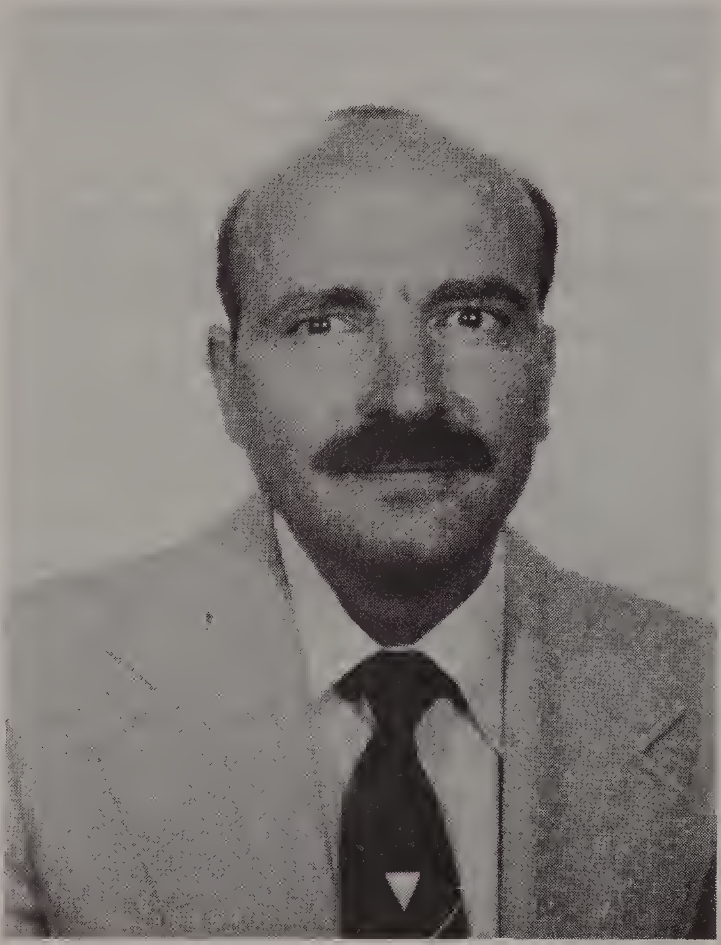
Details are set out of internationally agreed rights of freedom of association of workers and the ways in which freedom of association, in the form of conditions of employment that require individuals to be in membership of trade unions (closed shop arrangements), can present professional workers with dilemmas of responsibilities and duties.

The experience gained in countries of Member Societies of FECS-WPPA is drawn upon.

The WPPA, whilst being opposed to the principle of closed shops which include professional chemists, suggests that the dilemma cited above may be resolved if no-strike arrangements are negotiated for certain groups of professional workers.

## INTRODUCTION

In industrialized nations the vast majority of the work-force may be described as workers; the remaining minority are either employers or self-employed. The term 'worker' is used where appropriate in this paper in respect of the employed individual — consistent with the style adopted by the European Communities (EC) and the International Labour Organization (ILO). Many workers freely join trade unions of which the main aims are usually to regulate relations between workers and employers.



**Dr. J.-J. Salzmann, Chairman, WPPA**

In larger undertakings, workers are at three levels in the organizational hierarchy. They can be —
- manual workers (shopfloor)
- technical workers (foreman or supervisory)
- professional workers (managerial, scientific or technological).

This paper is concerned with the third tier — professional workers — and with those professional workers who are professional chemists.

Professional chemists have responsibilities to the professional bodies to which they belong and duties to trade unions to which they may also belong. There can be a dilemma between the respective responsibilities and duties especially if professional chemists are called out on strike.

## DISCUSSION

The ILO was established in 1919, under the Treaty of Versailles, with the League of Nations. In 1946 it became the first specialized agency associated with the United Nations. In April 1983 the Organization had 150 Member States. The aim of the ILO is to promote lasting peace through social justice, and to this end it works for better economic and social conditions everywhere. The ILO establishes international labour standards, which set guidelines for improving working conditions and protecting basic human rights; it runs a world-wide programme of technical assistance to developing countries; and it conducts research and disseminates information on the human aspects of economic activity, with a view to improving social and economic well-being.

Convention No. 87 of the ILO ('Convention concerning Freedom of Association and Protection of the Right to Organize' — which came into force on 4 July 1950) states in its Article 2:

> Workers and employers, without distinction whatsoever, shall have the right to establish and, subject only to the rules of the organization concerned, to join organizations of their own choosing without previous authorization.

Convention No. 98 of the ILO ('Convention concerning the Application of the Principles of the Right to Organize and to Bargain Collectively' — which came into force on 18 July 1951) states in its Article 1:

> 1. Workers shall enjoy adequate protection against discrimination in respect of their employment.
> 2. Such protection shall apply more particularly in respect of acts calculated to —
>    (a) make the employment of a worker subject to the condition that he shall not join a union or shall relinquish trade union membership;
>    (b) cause the dismissal of or otherwise prejudice a worker by reason of union membership or because of participation in union activities outside working hours, or, with the consent of the employer, within working hours.

Convention No. 87 has been ratified by the States of all Member Societies of the FECS; Convention No. 98 has been ratified by all but two (the Netherlands and Switzerland). In some countries, arrangements exist which make some form of union adherence or financial support obligatory. Examples are:

*Closed shop.* An arrangement whereby the employer is required to hire only employees who are union members. Retention of union membership is also a condition of continued employment.

*Union shop.* A form of union security which lets the employer hire whoever he pleases but requires all new employees to become union members within a specified period of time thereafter.

*Agency shop.* An arrangement obliging all employees to pay dues or service charges to a union. Non-union employees, however, are not required to join a union as a condition of employment.

*Qualified (or unqualified) union preference.* A type of union security under which the employer agrees to give first preference in hiring, etc., to individuals who are union members.

In many countries the law guarantees, either directly or indirectly, the right of an individual to refuse to adhere to a trade union organization and forbids the exercise of any constraint which would require an individual to become a union member or supporter. This right is referred to as negative freedom of association.

It is not a matter of debate whether professional workers should have a right to join trade unions. Save in special circumstances, such as the armed forces or the police, they have the right. It is whether they should have a right not to be involved in those activities of a trade union which they consider incompatible with their professional responsibilities.

In many countries, trade unions are increasing their scope of membership to include the professional worker. The ILO defines a 'professional worker' as:

> a person who has completed a higher level of education and vocational training or possesses recognized equivalent experience in a scientific, technical or administrative field; and who performs, as a salaried employee, functions of a predominantly intellectual character involving the exercise of a high degree of judgement and initiative and implying a relatively high level of responsibility. The term should also cover any person who, in addition to possessing these characteristics, has had delegated to him, by and under the general direction of his employer, responsibility for planning, managing, controlling and co-ordinating the activities of part of an undertaking or of an organization with the corresponding authority over other persons. The term does not cover top-level managers who have a large delegation of authority from their employers.

Member Societies of the WPPA have substantial numbers of professional workers as individual members.

There is a wide variation in the remit of Member Societies of the WPPA. The remit can range from one where the Member Society is a professional qualifying body where individual members are required to give an undertaking to conduct themselves honourably in the practice of the profession — and can face expulsion for misconduct — to one where the Member Society functions solely as a learned scientific body. There is also a wide variation in the legislative systems of individual countries of Member Societies of the WPPA. There can be laws that call for membership of a named professional body in order that the professional chemist may carry out specified statutory duties: some laws may formally permit closed shop arrangements; some countries may have written constitutional provisions that prohibit discrimination against the individual (in some countries these may be construed to include the individual who does not wish to join a trade union, thus effectively outlawing closed shop arrangements). There are wide variations in the industrial relations frameworks of individual countries of Member Societies of the WPPA. Some have a strong trade union structure that has developed over a century or more; some have a strong trade union structure that has developed over a relatively few decades. Some have a weak trade union structure arising from divisions on a political or a religious basis. There may be arrangements whereby contracts are negotiated between employers' and employees' representatives to run for a number of years and prohibit strikes during the lifetime of the contract; or arrangements with no such prohibition.

It is possible for facets of the systems described above to come together to present an adverse scenario for professional chemists. A country can have a professional qualifying body for chemists where individual members are required to give a written undertaking to conduct themselves honourably in the practice of their profession and can face expulsion for misconduct; it can have laws that call for membership of a named professional body in order that the professional chemist may carry out specified statutory duties; that country may have laws that formally permit closed shop arrangements. There will therefore be the possibility of a loss of employment arising from conflict at the interface of fulfilment of responsibility to a professional body (by not taking part in a strike and being expelled from the trade union), or arising from fulfilment of duty to a trade union (by taking part in a strike and being expelled from the professional body). This scenario already exists in one country of the WPPA. It is possible that it could come into existence in the next few years in others.

The dilemma facing certain professional chemists could be resolved by —

- excluding them from trade union membership,
- restricting them to a particular category of trade union membership (e.g. 'associate' member),
- providing them with 'no-strike' clauses in a contract.

Each suggested arrangement presents difficulties.

If professional workers were excluded *en bloc* from trade union membership they could be put at a disadvantage on two counts. First, they could find that pay differentials between themselves and their unionized subordinate colleagues might diminish or disappear. Second, they could find that they are squeezed out of decision-making processes — especially where consultations (on, say, industrial democracy) take place with trade union nominated representatives. Trade unions could be put at a disadvantage if they looked to professional workers to provide them with a substantial proportion of their present potential membership — and then, overnight, found that professional workers were to fall into an excluded category. Also the whole concept of freedom of association, embodied in ILO Convention No. 87, could be thrown into question. This arrangement would have to be provided through legislation and there is no reason to assume that such legislation would be passed in some countries of the WPPA.

If professional workers were restricted to 'associate' membership of trade unions, then presumably their rights, including collective bargaining and voting rights, would be curtailed in some way. It is likely that they could find themselves facing disadvantages similar to those cited above.

If professional workers were to have 'no-strike' arrangements these would have to be developed with goodwill and far-sightedness on the part of the employers and the trade unions representatives; goodwill and far-sightedness are commodities that are not always abundant.

## CONCLUSIONS

The WPPA recognizes that the actual or potential dilemma set out in this interface paper is restricted to a limited number of countries of the member societies of the WPPA; nevertheless, it could spread in the coming years.

The WPPA is of the opinion that:

- professional chemists should not be included in closed shop arrangements,
- professional chemists with statutory or onerous responsibilities who are in trade union membership should have no-strike arrangements negotiated for them, with suitable safeguards built in to compensate for any loss of collective bargaining rights.

## APPENDIX

### *Arrangements in Member States of the WPPA*

Freedom of association of workers exists in all Member States of the WPPA. Table 1 presents information on the degree of trade union membership in the Member States. There does not appear to be any legal restriction on the right of managerial and supervisory staffs to establish and join the organizations of their own choosing, as can be the case elsewhere (e.g. in Sweden where such a prohibition may be imposed by collective agreement). Closed shop arrangements are relatively uncommon but where they do exist they can be extensive. For instance they cover about one quarter of employees in the United Kingdom (i.e. about one half of trade union members). Some of the Member States have constitutional provisions that effectively outlaw closed shops on the grounds that they are discriminatory in character.

In the Federal Republic of Germany, Article 9 (3) of the Constitution reads, *inter alia*

> The right to form associations to safeguard and improve working and economic conditions is guaranteed to everyone and to all trades, occupations and professions. Agreements which restrict or seek to impair this right shall be null and void; measures directed to this end shall be illegal.

In Italy, Article 39 of the Constitution reads, *inter alia*

> Freedom in the organization of trade unions is affirmed. No compulsion may be imposed on trade unions except that of registering at the local or central offices according to the provisions of the law. A condition of registration is that the statutes of the unions sanction internal organization on a democratic basis.

In the Republic of Ireland, Article 40 of the Constitution reads, *inter alia*

> 1. The State guarantees liberty for the exercise of the following rights, subject to public order and morality:
>
>    (iii) The right of the citizens to form associations and unions.
>    Laws, however, may be enacted for the regulation and control in the public interest of the exercise of the foregoing right.

2. Laws regulating the manner in which the right of forming associations and unions and the right of free assembly may be exercised shall contain no political, religious or class discrimination.

The third sub-section of 1 has been interpreted in the courts as also giving the equal and opposite right of disassociation — the employee would have the right *not* to associate with a particular union.

In the Netherlands, there appears to be a safeguard against the possible discriminatory effect of closed shops. Article 161 of the Constitution, under the Fifth Chapter which is entitled 'Of public bodies for professions and trades', reads

> The decisions of these bodies which conflict with the law or public interest may be suspended and annulled in accordance with regulations to be determined by law. The law may render certain decisions of these bodies subject to approval in accordance with regulations to be determined by the law.

In contrast, although compulsory trade unionism may be outlawed there are cases where, with official approval, contributions are required from non-members of trade unions that approximate to the union dues. In Switzerland, collective agreements may call for a contribution of around 90% of the union dues from non-members.

The Constitution of the Hungarian People's Republic in its Section 65 (1) states

> The Hungarian People's Republic guarantees the right of association. The right of association is regulated by Act of Parliament.

The Preamble to the French Constitution of 1946 states, *inter alia*

> It is the duty of all to work and the right of all to obtain employment. No one shall suffer in his work or employment by reason of his origin, opinions or beliefs. Everyone may protect his rights and interests by trade union action and belong to the union of his choice.

The right to strike may be circumscribed by the nature and extent of procedures agreed between the two parties — the employers and trade unions. In Belgium and the United Kingdom conciliation and arbitration procedures have been in existence since the early part of this century but it is uncommon for them to be legally binding on the two parties. In Switzerland, an arrangement for 'labour peace', developed in the mid 1930s, although not legally binding, has been in operation particularly in the machine and metallurgical industries; collective agreements based on the arrangement may run for as long as 5 years.

Table 1. Trade union membership in Member States of the WPPA

| Country | Percentage of workforce in trade union membership | Year |
|---|---|---|
| Belgium | 75 | 1981 |
| Federal Republic of Germany | 41 | 1981 |
| France | 23[1] | 1981 |
| Greece | 30[2] | 1982 |
| Hungary | 80[3] | 1975 |
| Italy | 43 | 1981 |
| Netherlands | 50 | 1977 |
| Portugal | N/A | — |
| Republic of Ireland | 30[2] | 1976 |
| Spain | N/A | — |
| Switzerland | N/A | — |
| United Kingdom | 46 | 1981 |
| Yugoslavia | N/A[4] | — |

[1] Mainly banking, public sector, production industries

[2] Figure is approximate

[3] Figure will not have changed much since then

[4] The vast majority of the state sector is in trade union membership, there being 4,600,000 employees, of whom 95% are in unions. The total workforce is 8,500,000.

# PURE AND APPLIED CHEMISTRY

The contents of the last two 1984 issues of PAC will be:

| Issue | Pages | Contents |
|---|---|---|
| Vol. 56 (1984)<br>No. 11, November | 1511 – 1600 | Plenary lectures presented at the 4th International Conference on High Temperature and Energy-related Materials, Santa Fe, New Mexico, USA, 2 – 6 April 1984 |
| | 1603 – 1657 | Plenary lectures presented at the 23rd International Conference on Coordination Chemistry, Boulder, Colorado, USA, 29 July – 3 August 1984 |
| No. 12, December | | Plenary lectures presented at the 10th International Symposium on the Reactivity of Solids, Dijon, France, 27 August — 1 September 1984 |
| | | Plenary lectures presented at the 7th International Conference on Physical Organic Chemistry, Auckland, New Zealand, 20 – 24 August 1984 |

So we end the year with no Commission reports in PAC. If, however, we had not adopted the new system for recommendations on nomenclature and symbols the Provisional Recommendation abstracted on p. 38 would probably have appeared in one of these issues. Over the year, thirty Commission reports have been published which is clear enough evidence of the work that is done by IUPAC bodies — and that does not include the books. The impartiality that must be shown by the Editor forbids him to point out which Division had far and away the largest number of reports published.

# PROVISIONAL RECOMMENDATIONS

## IUPAC seeks your comments

In CI, 1983, No. 5, 42–43, the details of a proposed revised procedure for comment and approval of recommendations on nomenclature and symbols were given. The system has now come into operation and reproduced below is the synopsis of the second Provisional Report to be processed in this way.

It must be emphasized that copies of the full report cannot be obtained from the IUPAC Secretariat but only from your own — or the nearest to you* — national/regional centre. Copies will be sent on request, but on the understanding that comments will be sent, to the address on the document, not more than 8 months after publication of the synopsis in CI.

National/regional centres are:

**Argentina**
Dr. J. M. Barnett, Asociación Química Argentina, Sánchez de Bustamente 1749, Buenos Aires, Argentina

**Asia (Bangladesh, Hong Kong, Indonesia, Iraq, Korea, Malaysia, Nepal, Phillipines, Singapore, Sri Lanka, Thailand)**
Prof. H. H. Huang, Chemistry Department, National University of Singapore, Kent Ridge, Singapore 0511.

**Australia and New Zealand**
Mr. R. Schoenfeld, Australian Journal of Chemistry, POB 89, 314 Albert Street, East Melbourne, Victoria 3002, Australia.

**Canada**
Prof. J. ApSimon, Department of Chemistry, Carleton University, Ottawa, Ontario K1S 5B6, Canada.

**China**
Prof. Cui Meng-Yuan, Chinese Chemical Society, POB 2709, Beijing, China.
Prof. F. C. Chen, Department of Chemistry, National Taiwan University, POB 30–373, Taipei 107, Taiwan.

**France**
Prof. Y. Jeannin, Comité Nationale de la Chimie, 28 rue Saint-Dominique, F-75007 Paris, France.

**FRG, Austria and Switzerland**
Prof. H. Grünewald, c/o Verlag Chemie GmbH, Postfach 1260/1280, Pappelallee 3, D–6940 Weinheim, Federal Republic of Germany.

**Hungary**
Prof. E. Pungor, Altalános és Analitikai Kémiai Tanszek, Budapesti Müszaki Egyetem, Gellért tér 4, H-1521 Budapest XI, Hungary.

**India**
Mr. A. K. Bose, Indian National Science Academy, Bahadur Shah Safar Marg, New Delhi-110002, India.

**Israel**
Prof. S. Sarel, Department of Pharmaceutical Chemistry, School of Pharmacy, Hebrew University of Jerusalem, POB 12065, Jerusalem, Israel.

**Japan**
Dr. H. Hamada, Executive Director, Chemical Society of Japan, 1–5 Kanda Surugadai, Chiyoda-ku, Tokyo, 101 Japan.

**Netherlands**
Ir. E. J. de Ryck van der Gracht, Koninklijke Nederlandse Chemische Vereniging, Postbus 90613, 2509 LP Den Haag, Netherlands.

---

*As a last resort please write to: Dr. K. L. Loening, Chemical Abstracts Service, POB 3012, Columbus, OH 43210, USA.

**Scandinavia**
Dr. K. Samuelsson, Acta Chemica Scandinavica,
Wallingatan 26 A, S-111 24 Stockholm, Sweden.

**South Africa**
Dr. J. R. Bull, Organic Chemistry Division,
National Chemical Research Laboratory, POB
395, Pretoria 0001, Republic of South Africa.

**UK**
Dr. A. McNaught, Royal Society of Chemistry,
Burlington House, Piccadilly, London, W1V 0BN,
UK.

**USA**
Dr. Marianne Brogan, Journals Department,
American Chemical Society, POB 3330, 2540
Olentangy River Road, Columbus, OH 43210,
USA.

**USSR**
Prof. G. B. Bokij, Commission on Nomenclature,
National Committee of Soviet Chemists,
Academy of Sciences of USSR, Kosygin Street 4,
SU-117977 Moscow V-334, USSR.

## The absolute electrode potential (*Provisional*)

The document begins with the illustration of the most widespread misunderstandings in the literature about the physical meaning of absolute electrode potential. The correct expression for this quantity is then derived by a thermodynamic analysis of the components of the emf of an electrochemical cell. It is shown that *in principle* three reference levels can be chosen to measure an absolute value of the electrode potential. Only one of these possesses all the requisites for a meaningful comparison on a common energy scale between electrochemical and physical parameters. Such a comparison is the main problem for which the adoption of a correct scale for absolute electrode potentials is a prerequisite. The document ends with the recommendation of critically evaluated values for the absolute potential of the standard hydrogen electrode in water and in a few other protic solvents.

*Comments on this report must be received by Prof. S. Trasatti before the end of July 1985.*

# ICSU General Assembly 1984

**by Prof. T. S. West**
**IUPAC Secretary General**

I had the unique experience of attending the ICSU General Assembly in Ottawa in September 1984 as IUPAC representative, along with our President who is domiciled in the Canadian capital city. All of our submissions to ICSU in relation to Agenda items had already been made in writing, e.g. comments on proposals for changes to Statutes and Rules of Procedure and on a precirculated discussion document from their Executive Board entitled *Issues Before ICSU* on which we had made extensive comments. We were rather pleased that IUPAC was one of only two of the 20 Union members who had sent written comments along with two of the 65 Member Nations. Our comments were circulated as a composite with those of the three others at the meeting. This enabled us to sit back and survey the verbal presentations from the floor in a relaxed fashion though, on reflection, it probably did give us a rather low profile during the actual discussion. Some of the issues may be of interest to IUPAC readers and so I have submitted to severe pressure from the Editor to "write a few words" about the Assembly.

**Sir John Kendrew, left, to Secretary General Ernster, "Have you heard the one about IUCAP?"**

### The biter bit

Readers of *Chemistry International* (CI) should theoretically be *au fait* with what ICSU is and what it does because of the Editor's own excellent article on the subject in CI, 1983, No. 4, pp. 25–28 — except that they may be slightly confused by the acronym ISCU which appears in the title of the article and a further three times in the first 18 lines. Even Editors nod occasionally!*

Before going further, let me say also that the grim looking photographs of the ICSU President, Treasurer and Executive Secretary in that issue are entirely misleading. They are in fact very nice people! As I indicated above, the Editor's article is a very fine one and identifies the essential nature of this mother organization of international scientific unions — viz. its internationality, its remarkable interdisciplinary

---

*Admitted. See also CI, 1983, No. 5, p. 63 — *Editor* viewpoint, its dedication to scientific integrity and its ever present urge to ensure that international scientific activities should be coordinated and applied to the benefit of mankind. It also highlights the perplexing multiplicity of the acronym sets of initial letters that are tossed around ICSU discussions and documentation in referring to Unions, Special Committees, etc. It has been said that the 'C' in IUPAC sometimes stands for Confusion. I assure you that in the field of acronyms ICSU is a long way ahead of IUPAC. Do you know the difference between IGU, IUGG, IUGS or even IUB and IUBS, IMU and IUMS? One Union delegate held his Union identification card up to me with a shrug of despair. Even ICSU gets it wrong it seems — the initials on the card were IUPHS! The inset may help the reader.

| | |
|---|---|
| IAU | INTERNATIONAL ASTRONOMICAL UNION |
| IUGG | INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS |
| IUPAC | INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY |
| URSI | UNION RADIO SCIENTIFIQUE INTERNATIONALE |
| IUPAP | INTERNATIONAL UNION OF PURE AND APPLIED PHYSICS |
| IUBS | INTERNATIONAL UNION OF BIOLOGICAL SCIENCES |
| IGU | INTERNATIONAL GEOGRAPHICAL UNION |
| IUCr | INTERNATIONAL UNION OF CRYSTALLOGRAPHY |
| IUTAM | INTERNATIONAL UNION OF THEORETICAL AND APPLIED MECHANICS |
| IUHPS | INTERNATIONAL UNION OF THE HISTORY AND PHILOSOPHY OF SCIENCE |
| IMU | INTERNATIONAL MATHEMATICAL UNION |
| IUPS | INTERNATIONAL UNION OF PHYSIOLOGICAL SCIENCES |
| IUB | INTERNATIONAL UNION OF BIOCHEMISTRY |
| IUGS | INTERNATIONAL UNION OF GEOLOGICAL SCIENCES |
| IUPAB | INTERNATIONAL UNION OF PURE AND APPLIED BIOPHYSICS |
| IUNS | INTERNATIONAL UNION OF NUTRITIONAL SCIENCES |
| IUPHAR | INTERNATIONAL UNION OF PHARMACOLOGY |
| IUIS | INTERNATIONAL UNION OF IMMUNOLOGICAL SOCIETIES |
| IUMS | INTERNATIONAL UNION OF MICROBIOLOGICAL SOCIETIES |
| IUPsyS | INTERNATIONAL UNION OF PSYCHOLOGICAL SCIENCES |

## Facing up to global change

However, these introductory remarks should not cloud the real and earnest discussions that took place at the ICSU Assembly. During the meeting the General Committee, corresponding to our Bureau, met three times and there were meetings of the Scientific Priorities Committee, the Executive Board (corresponding to the IUPAC Executive Committee, but labelled 'Bureau' in the French text) and the Finance Committee. There were also several sessions on ICSU publications, meetings of inter-Union groups in the Earth Sciences, Physical Sciences and Biological Sciences and various *ad hoc* groups, e.g. in relation to Biotechnology, Education and Man's Impact on the Global Environment. During the Assembly there were also three experimental symposia, a whole day on Global Change and two half day ones on Science Education and Gene Technology, respectively.

There was considerable discussion throughout the Assembly on the subject of Global Change and although I was disappointed by the presentation of the actual symposium itself, which consisted of a series of panels with much procedural talk and little presentation of work by the scientists concerned, the precirculated volume of papers was excellent and a small summing up presentation made during the Assembly's own discussions on the topic was quite magnificent.† As a result of the concerns expressed by the representatives of the various Unions and National Members, ICSU will formulate policies concerning mankind's impact on his own planet and future implications which may well result, in due course, in the evolution of a scientific activity corresponding to the original International Geophysical Year concept, which was one of ICSU's major achievements. It is now clear that recent changes in technology, e.g. remote sensing, and overall scientific capability, e.g. modelling, have put science in a position to make measurements and draw worthwhile deductions that would not previously have been possible. The impact of the thinking and capabilities of the Biological Sciences as expressed by their Unions was clearly a revelation to the Physical and Earth Science Unions. It does

---

†I understand that ICSU Press will publish the text of the augmented precirculated manuscript in due course. I recommend it for careful reading by all chemists.

**ICSU Top Table 1982-1984. From left to right: Acad. G. K. Skryabin (USSR) Vice-President Extraordinary; Mr. F. W. G. Baker, Executive Secretary; Sir John Kendrew (UK), President; Prof. L. Ernster (Sweden), Secretary General; Mme. J. Marton-LeFevre, Assistant Executive Secretary; Prof. T. F. Malone (USA), Treasurer**

appear that ICSU may be on the threshold of planning an exciting and (potentially) extremely valuable initiative for the welfare of mankind and all other forms of life on planet Earth. There will obviously be a great deal of chemistry involved, but whether or not this will be distinct from biochemistry, geochemistry, etc., is still unclear. Nevertheless, I venture to suggest that IUPAC may want to make a significant contribution to this ICSU venture in due course when it becomes clearer what action is to be proposed for the ICSU family.

## Whither biotechnology?

As many in IUPAC will know, we have a Commission on Biotechnology in our Division of Applied Chemistry. Considerable pressure has been brought to bear by various bodies on both IUPAC and ICSU to set up an extensive organization for biotechnology somewhere within the ICSU family of Unions. There have, for example, been suggestions that IUPAC should form a Division of Biotechnology and in the process take in the other relevant disciplines of chemical engineering, microbiology, etc., to allow greater coverage of the subject than can be provided by chemistry alone. Others have asked ICSU to form a Union of Biotechnology. In IUPAC, we favour the formation of an ICSU Inter-Union Commission or Scientific Committee on Biotechnology, whilst, maintaining our own stance. Since we see chemistry as the mainstay discipline around which the rest of biotechnology must be centred, we have expressed these views to ICSU during the meeting of Bio-Unions, which we attended specifically for this purpose. IUPAC could be lead-Union in such an ICSU Inter-Union Commission. Be that as it may, all the Unions concerned have agreed to communicate to the ICSU Secretariat a list of their biotechnology projects and future intentions by 1st December 1984, so that the ICSU Executive Board can survey the present status of biotechnology within the ICSU family and set up a forum for further discussion by a "retreat" meeting of the relevant Bio-Unions during the next meeting of the General Committee in October 1985.

## ICSU concerns for the future

ICSU itself is concerned with the workings of its internal organization and with its role in the world's scientific community; we had observations on almost all the questions that were posed. It would be impractical to discuss all of these here. We opposed a suggestion that the General Committee should be disbanded and the Executive Board extended to compensate and this view won the day. We also expressed our concern that the Assembly should be held every 3 years, instead of every 2 as at present, on the grounds that it would reduce the visibility of ICSU and would result in clashes with our own biennial Assemblies. Some readers may remember a similar debate within IUPAC only a few years ago.

It was also interesting to find that, like IUPAC, ICSU has been revising its dues structure and that it also uses a formula approach similar to the one we adopted in Lyngby:

$$\text{Due} = \tfrac{1}{2}\,(x^2 + x)F + 1000 \text{ US dollars}$$

where $x$ is the category of membership and $F$ is fixed from year to year, being taken as 100 for 1985 to balance ICSU's needs. The minimum due is US\$1100 ($x=1$) and the maximum due, $x = 46$, is US\$109,100. There is also a minimum subscription (MS) = US\$1000 for countries considered as Associates. This constitutes an introductory membership and MS members are expected to move to an appropriate point on the scale in due course. Their position is reviewed by an Admissions Committee after 4 years. I found it interesting that National Members are free to select their category of membership without apparently any criteria or relationship to scientific activity, scientific turnover, etc. This differs considerably from IUPAC's method of assessment.

In passing over to the new dues structure the ICSU National Members are expected to select a category in the new structure at approximately the same financial level as at present and in 1985 they will be asked to pay at the same level as in 1984. In future, ICSU National Members will be asked to give one year's notice of intention to reduce their category of adherence to ICSU.

One feature which rather intrigued me was a new resolution which was accepted without opposition and which IUPAC might well copy in a modified form to its own advantage. In future, when the ICSU Assembly votes a new Union into the ICSU family the dues of *all* National Members will be increased by 3% automatically because ICSU calculates that, at present, each Union costs it about US$35,000 per biennium. Formerly, only those countries adhering to the new member Union were asked to increase their dues.

How does this relate to IUPAC? I suppose that the equivalent is the introduction of a new Division or maybe '*X*' new Commissions. At the moment IUPAC has either cut back on existing activities in order to launch new initiatives or eliminated an approximately equal number of existing Commissions to allow the new Division/Activity to be undertaken. On the other hand, we are very much aware that most of our NAOs already reckon IUPAC to be their most expensive Union. No new Union was admitted on this occasion at the ICSU Assembly though there was some discussion on the splitting of one Bio-Union into two, the existing Union being required, as a matter of routine, to change its name and to have to give reasons why its membership should be continued!

## ICSU votes and National Members

Union members of ICSU wield three votes whilst National Members have one vote. When, however, it comes to matters relating to subscriptions to ICSU, Union Members have only one vote and I was interested to see that several Unions did not exercise their right to vote in relation to financial matters or the election of National Members to the General Committee. On the General Committee itself there are representatives of all 20 Unions and of 13 National Member countries.

The officers elected at Ottawa were:

President, Sir John Kendrew (UK)
Vice President, Dr. W. A. Rosenblith (USA)
Vice President, Extraordinary Acad. G. K. Skryabin (USSR)
Secretary General, Prof. L. Ernster (Sweden)
Treasurer, Prof. K. Thurau (FRG)

Lastly, I was interested to find out that the following 24 countries are members of ICSU but do not adhere to IUPAC. Their membership category is indicated along with the number of Unions they adhere to and the dues they pay.

| | Category/Unions | 1984 Sub. US$ |
|---|---|---|
| Bolivia | MS/3 | 1000 |
| Chile | 2/15 | 5160 |
| Ghana | MS/6 | 1000 |
| Indonesia | MS/8 | 1000 |
| Iran | 2/9 | 3096 |
| Jordan | MS/2 | 1000 |
| Kenya | MS/3 | 1000 |
| Korea DPR | MS/4 | 1000 |
| Lebanon | MS/3 | 1000 |
| Madagascar | MS/3 | 1000 |
| Mexico | 3/16 | 11008 |
| Monaco | MS/3 | 1000 |
| Mongolia | MS/– | 1000 |
| Morocco | MS/4 | 1000 |
| Nigeria | MS/10 | 1000 |
| Pakistan | 1/5 | 1100 |
| Philippines | MS/9 | 1000 |
| Sri Lanka | MS/3 | 1000 |
| Sudan | 1/4 | 1100 |
| Thailand | MS/7 | 1000 |
| Tunisia | MS/3 | 1000 |
| Uruguay | MS/6 | 1000 |
| Vatican City | MS/1 | 1000 |
| Vietnam | MS/2 | 1000 |

The position of Chile, Iran, Mexico, Pakistan and Sudan is interesting and it is surprising that some of the MS countries have adherence to as many as 6, 7, 8, 9 or even 10 Scientific Unions, but not IUPAC! Should we take action? Countries in IUPAC but not in ICSU appear to be Colombia, Malaysia, Peru and the Syrian Arab Republic.

# A GUIDE TO SOURCES OF IUPAC-APPROVED TERMINOLOGY OF PURE CHEMISTRY

Compiled and prepared for publication by
Prof. V. Gold, IDCNS (Division III)

Sensible scientific communication and discussion can proceed only if the participants in this intercourse attach the same meaning to the terms they use. For this reason, several IUPAC Commissions have devoted much energy to the preparation of reports dealing with the terminology in their respective fields. The present compilation of such reports that have been published in PAC seeks to take stock of these activities, and to provide some guidance for those seeking information on sources of terminology. It gives a list of the titles of relevant reports with, in each case, an indication of its scope, supplemented by a selection of typical terms included.

For the present, the compilation has been arbitrarily limited to Physical, Inorganic, Organic, Macromolecular and Analytical Chemistry. Whilst definitions and terminology related to chemical nomenclature do form a part of this Guide, the actual rules of nomenclature (i.e. for naming chemical species) are excluded.

The order of entries in the list follows the sequence of numbering of the IUPAC Divisions (Physical, Inorganic, Organic, Macromolecular, Analytical) involved. Titles of reports have been suitably rearranged or shortened so as to emphasize their scope for the present purpose. In some cases the subject matter of these reports is complemented by entries in documents issued by the IUPAC–IUB Joint Commission on Biochemical Nomenclature (JCBN) or by the Nomenclature Committee of the International Union of Biochemistry (NC–IUB). Where appropriate, cross references to such publications are indicated.

A driving force for the present contribution has been the realization that, even within the core of pure chemistry, several alternative interpretations of a given term may be current. Without at this stage seeking to pre-judge the question whether, in any given case, such practice is deplorable, desirable or perhaps unavoidable, we feel that the further creation of conflicting definitions ought not to be encouraged. The present report accordingly aims to foster a greater awareness of what IUPAC has already done and is now doing in the area of chemical terminology. It has been prepared in the hope and expectation that it will lead to a wider acceptance of our agreed common language and put some brake on the development of new variants in the definitions of old terms. As a further contribution towards this goal, the Interdivisional Committee on Nomenclature and Symbols (IDCNS) is planning to prepare an index of all terms used in these reports, with the longer-term aim of compiling a consolidated glossary of chemical terminology, which would include alternative interpretations where necessary.

At least at this stage, we are confining our attention to reports emanating from within IUPAC, and it is not our plan, in this programme, to seek definitions or redefinitions of words that present no conceptual problems and which occur in the ordinary vocabulary of chemists or of laymen.

The help given by Commission Secretaries and Chairmen in providing information for this report is gratefully acknowledged.

## PHYSICAL CHEMISTRY

P.1 PHYSICOCHEMICAL QUANTITIES AND UNITS
(Manual of Symbols and Terminology for)
PAC **51**, 1–36 (1979).

The main aim of this report (the 'Manual' or 'Green Book') is to provide the 'basic grammar and symbols' for algebraic equations in chemistry. It also inlcudes definitions of the basic units and of the multiples and submultiples allowed in SI, and of some other terminology in the context of quantities and units.

*Typical terms:* physical quantity; specific; molar; degree Celsius; bar; nuclide; electrode potential. A revision (in preparation) will incorporate recent agreed changes in the definition of the metre, of pH, of standard pressure, and of rate of reaction.

P.2 ACTIVITIES AND RELATED QUANTITIES
(Definition of)
PAC **51**, 37–41 (1979).

This report forms Appendix I of P.1, and relates to gases, liquids, gaseous and liquid mixtures and solutions.

*Typical terms:* fugacity; mixture; solution; relative activity; osmotic coefficient.

### P.3 CHEMICAL KINETICS
(Symbolism and Terminology in)
PAC **53,** 753–771 (1981).

This *provisional* report (Appendix V of P.1) is concerned with the precise definitions (in context) of terms relevant to general and fundamental concepts in chemical kinetics, and the corresponding symbols. The definitions partly overlap (and are generally consonant with) those in 0.2, and in recommendations for enzyme kinetics (NC-IUB; *Eur. J. Biochem.* **128,** 281–291 (1982).

*Typical terms:* reaction stoichiometry; rate of consumption; rate of reaction; order of reaction; relaxation time; steady state; potential-energy; hypersurface; molecular dynamics; stochastic theory.

### P.4 UNCERTAINTIES OF NUMERICAL RESULTS OF THERMODYNAMIC MEASUREMENTS
(Assignment and Presentation of)
PAC **53,** 1805–1825 (1981).

This *provisional* report on symbols and terminology is generally fully concordant with the Analytical Division's Compendium (A.1).

*Typical terms:* newly defined here are imprecision; inaccuracy.

### P.5 SIGNIFICANCE OF THE WORD *STANDARD* IN CHEMICAL THERMODYNAMICS
(Notation for States and Processes and Remarks on Commonly Tabulated Forms of Thermodynamic Functions)
PAC **54,** 1239–1250 (1982).

This report is concerned with thermodynamic notation but also includes the definition of the concept 'standard' in thermodynamics.

### P.6 INTERPHRASES IN SYSTEMS OF CONDUCTING PHASES
PAC **55,** 1251–1268 (1983).

This *provisional* document (an Appendix of P.1), to be used in conjunction with earlier Appendices, expands the recommendations for nomenclature concerned with interphases containing electrically charged particles. It suggests terms for the description of the interphase itself, following which it contains sections on the nomenclature for electric potentials at free surfaces and in interphases between metals, semiconductors and electrolytes. Nomenclature for the thermodynamic properties of the interphase at equilibrium is recommended and quantities related to the description of the structure of the interphase are discussed, including situations of the adsorption of ions or molecules and the possibility of partial charge transfer.

*Typical terms:* interface; interphase; electron work function; contact potential difference; diffuse layer; superficial work.

### P.7 ELECTROCHEMICAL NOMENCLATURE
PAC **37,** 499–516 (1974).

This report (Appendix III of P.1) deals with symbols and terminology relating to galvanic cells, thermodynamics of charged single phases and the equilibrium between two charged phases, phenomena at electrode/electrolyte interfaces at equilibrium, activities, transport phenomena (superseded by P.10), and kinetics of reactions at electrodes (superseded by P.9)

*Typical terms:* charge number of the cell reaction; standard potential; electrochemical potential; Galvani potential difference; stoichiometric mean molal activity coefficient; anode; exchange current.

### P.8 QUANTUM CHEMISTRY
(Expression of Results in)
PAC **50,** 75–79 (1978).

This report formulates advice on the inclusion of physical constants in the output information of theoretical papers. It contains formulae defining the terms Bohr radius and Hartree energy.

### P.9 ELECTRODE REACTION ORDERS, TRANSFER COEFFICIENTS AND RATE CONSTANTS
PAC **52,** 233–240 (1980).

This report amplifies and in part supersedes an earlier one (P.7) in respect of kinetic concepts associated with electrode reactions.

*Typical terms:* electrode process; faradaic current density; charge transfer step; rate constant.

### P.10 TRANSPORT PHENOMENA IN ELECTROLYTIC SYSTEMS
(Nomenclature for)
PAC **53,** 1827–1840 (1981).

The report (an Appendix of P.1), to be used in conjunction with P.7, deals with the transport phenomena of importance to electrochemists and electrochemical engineers. The first section is concerned with mass transport in general and the concepts appearing in the relationships of irreversible thermodynamics. The main part treats electrolytic systems, in particular dilute solutions, and considers mass transport by diffusion, convection and ionic migration under the influence of an electric field. Transport of charge, the flow of current through the solution and through the electrode and the precise meaning of concepts related to mass transport are also considered.

*Typical terms:* flux density; transport number; electrode current density; secondary current distribution; current efficiency; transport control.

### P.11 MÖSSBAUER SPECTROSCOPIC DATA
(Nomenlature and Conventions for Reporting)
PAC **45,** 211–216 (1976).

Includes relevant terminology.

*Typical terms:* isomer shift; quadruple coupling constant; quadrupole splitting.

### P.12 ELECTRON SPECTROSCOPY RESULTING FROM EXCITATION BY PHOTONS
(Nomenclature and Spectral Presentation in)
PAC **45,** 221–224 (1976).

A concise attempt at simplification.

*Typical terms:* ESCA; PES.

### P.13 SYMBOLISM AND NOMENCLATURE FOR MASS SPECTROMETRY
(Recommendations for)
PAC **50,** 65–73 (1978).

The report contains lists of terms, abbreviations and acronyms in use and which should be retained. There are recommendations for the representation of ions and the number of charges carried by an ion and for the naming of the parts of a mass spectrometer.

*Typical terms:* α-cleavage; monoisotopic mass spectrum; parent ion.
A revision of this report is in preparation.

### P.14 MOLECULAR FORCE CONSTANTS
(Definition and Symbolism of)
PAC **50,** 1709–1713 (1978).

In addition to giving a systematic symbolism for defining molecular co-ordinates, interatomic distances and angles, this document defines terminology in common use and a number of commonly used force fields.

*Typical terms:* rocking; twisting; wagging.

### P.15 COLLOID AND SURFACE CHEMISTRY
(Definitions, Terminology and Symbols in)
PAC **32,** 477–638 (1972).

This document (Appendix II, Part 1, of P.1) seeks to provide a consistent terminology in its field.

*Typical terms:* negative adsorption; absorption; physisorption; capillary condensation; Gibbs dividing surface; adsorption isobar; dynamic surface tension; immersional wetting; surface excess entropy; colloidal dispersion; froth; lyophilic; dialysis; orthokinetic aggregation; emulsifier; Krafft point; Newton black film; Gibbs film elasticity; swelling pressure; rotational diffusion coefficient; electro-osmosis.

### P.16 HETEROGENEOUS CATALYSIS
PAC **46,** 71–90 (1976).

This report, forming part of Appendix II of P.1 (Part 2 of P.14), seeks to establish unambiguous terminology in its field, on the basis that no term should be used in a sense different from that in physical chemistry in general or in other branches of chemistry.

*Typical terms:* multilayer adsorption; surface coverage; dissociative chemisorption; active site; bifunctional catalysis; doping; pulse reactor; associative desorption; catalytic hydrocracking.

### P.17 RHEOLOGICAL PROPERTIES
(Definitions, Terminology and Symbols for)
PAC **51,** 1213–1218 (1971).

The scope of the report (Part I.13 of Terminology and Symbols in Colloid and Surface Chemistry) is summarized by the following typical entries: rheology; Newtonian fluid; volume viscosity; shear thinning; surface dilatational viscosity.

### P. 18 LIGHT SCATTERING
PAC **55,** 931 (1983).

This *provisional* report is to form a part of Appendix II of P.1 (concerned with definitions, terminology and symbols in colloid and surface chemistry).

*Typical terms:* light scattering; inelastic scattering; scattering plane; Rayleigh ratio; Stokes parameters; albedo; correlation volume; Zimm plot.

## ORGANIC CHEMISTRY

### 0.1 NOMENCLATURE OF ORGANIC CHEMISTRY

The main body of nomenclature reports, including some *provisional* documents, was published in 1979 as a collected volume ('The Blue Book'; Nomenclature of Organic Chemistry) by the Commission on Nomenclature of Organic Chemistry. This volume contains a number of incidental definitions and terminology, the more important ones of which appear on the pages indicated below (with some typical examples in each case):

| | |
|---|---|
| pp.xviii–xix: | trivial name; radicofunctional name; . . . |
| p. 20 : | cumulative |
| p. 23 : | ortho-fused; peri-fused |
| p. 31: | bridge; bridgehead |
| p. 33: | tricyclo; . . . |
| p. 41: | senior |
| p. 42: | ring assembly |
| p. 82: | substituent; characteristic group; . . . |
| pp.324–5: | (duplicates some definitions) |
| pp.337–9: | coordination entity; central atom; ligand; oxidation number; . . . |
| pp.464–5: | *catena; closo; triprismo; nido;* . . . |
| pp.473–90: | stereoisomer; configuration; relative stereochemistry; chirality; asymmetric atom; torsion angle; *R/S*<br>(This terminology is currently undergoing revision; Report O.b. JCBN recommendations for the |

conformational terminology of 5- and 6-membered ring forms of monosaccharides and their derivatives are given in PAC **53,** 1910–1905 (1981).)

pp.513: isotopically modified; isotopically substituted; selectively labeled; . . .

O.2 PHYSICAL ORGANIC CHEMISTRY
(Glossary of Terms Used in)
PAC **55,** 1281–1371 (1983).

The Glossary gives an alphabetically arranged list of definitions. Terms satisfactorily covered in standard dictionaries or text books or in other IUPAC terminology reports are excluded, as are named reactions (such as Diels–Alder) and symbolic representations of mechanisms ($S_N$1 etc.).

*Typical terms:* abstraction reaction; acidity functions; ambident; antarafacial; carbenium ion; chemical flux; chemical species; colligation; contributing structure; cryptand; detailed balancing; electrocyclic reactions; electrophilicity; entropy of activation; frontier orbitals; geminate recombination; general acid catalysis; homoaromatic; hyperconjugation; ion-pair return; kinetic equivalence; molecular rearrangement; oxidation; rate-limiting step; telomerization; transient. Terms relating to concepts of chemical kinetics are generally consonant with the later and more complete *provisional* report P.3.

## MACROMOLECULAR CHEMISTRY

M.1 POLYMERS
(Basic Definitions of Terms Relating to)
PAC **40,** 477–491 (1974).

A summary of the terminology of polymer chemistry.

*Typical terms:* oligomerization; regular; polymer; graft polymer; random copolymer.

M.2 STEREOCHEMICAL DEFINITIONS AND NOTATIONS RELATING TO POLYMERS
PAC **53,** 733–752 (1981).

This report is a summary of the usage of stereochemical terminology as applied to macromolecules. (The specific terminology for polysaccharides and polynucleotides, recommended by JCBN, is given in PAC **55,** 1269–1272 and 1273–80, (1983), respectively.)

*Typical terms:* configurational unit; tacticity; ditactic; disyndiotactic; stereoblock; erythrodiisotactic; triad isotacticity.

## ANALYTICAL CHEMISTRY

A.1 COMPENDIUM OF ANALYTICAL NOMENCLATURE
Pergamon Press, Oxford, 1978.

This compilation (the 'Orange Book') includes a full range of terminology recommended by the Commissions of the Division of Analytical Chemistry and published in PAC up to 1978. It deals with precision balances; scales of working; contamination phenomena in precipitations; automatic analysis; thermal analysis; mass spectroscopy; pH; solution equilibria; liquid–liquid distribution; chromatographic methods; atomic emission and flame spectroscopy; electroanalytical methods; data interpretation. Later developments are to be found in subsequent Commission reports listed below.

A revision of the Compendium is due to be completed this year.

A.2 TRANSFER OF SOLUTES FROM ONE SOLVENT TO ANOTHER
(Proposed Terminology and Symbols for the Quantity Representing the)
PAC **50,** 587–591 (1978).

The report is confined to the definition of the term *transfer activity coefficient.*

A.3 PRECONCENTRATION FOR INORGANIC TRACE ANALYSIS
PAC **51,** 1195–1211 (1979).

The report contains the terminology of preconcentration and defines terms such as selective preconcentration and group preconcentration.

A.4 ELECTROANALYTICAL CHEMISTRY
(Recommended Terms, Symbols, and Definitions for)
PAC **51,** 1159–1174 (1974).

This *provisional* document complements in scope the report on Electrochemical Nomenclature (P.7). It supplements the earlier terminology report on electroanalytical chemistry included in A.1 by giving explanations and definitions of the terms and symbols used.

*Typical terms:* chronopotentiometric constant; net faradaic current; depolarizer; auxiliary electrode; supporting electrolyte; thickness of reaction layer.

A.5 SURFACE ANALYSIS TECHNIQUES
(Recommendations for Nomenclature, Standard Procedures and Reporting of Experimental Data for)
PAC **51,** 2243–2250 (1979).

The report deals with the more modern spectroscopic methods for the chemical analysis of surfaces.

*Typical terms:* Auger electron spectroscopy (AES); X-ray photoelectron spectroscopy (XPS); secondary ion mass spectrometry (SIMS); secondary ion yield; sputter yield.

A.6 X-RAY EMISSION SPECTROSCOPY
(Nomenclature, Symbols, Units and their Usage in Spectrochemical Analysis — IV).
PAC **52,** 2541–2552 (1980).

This report concerns the terminology associated with the description of the sample, the excitation of emission lines, measurement of their intensity and conversion of X-ray intensity to concentration by calibration procedures. Parallels with and differences from optical emission spectroscopy are noted.

*Typical terms:* Solid–solution sample; bremsstrahlung; mass attenuation coefficient; secondary fluoresence; angular dispersion; collimator resolution; energy dispersion; analytical curves.

A.7 NUCLEAR ANALYTICAL CHEMISTRY
PAC **54,** 1533–1554 (1982).

This *provisional* report gives an alphabetic list of close to 400 terms and definitions commonly used in radiochemistry with emphasis on radioanalytical chemistry.

*Typical terms;* absorber; specific activity; annihilation; barn; branching decay; capture cross section; decay constant; secular equilibrium; cumulative fission yield; gamma cascade; geometric attenuation; multiplication neutron; pile-up; quenching; radiochemical yield; saturation activity; thermal column.

A.8 AMPLIFICATION REACTION
(Recommendations on Use of the Term)
PAC **54,** 2553–2556 (1982).

The scope of the report is fully explained by its title.

A.9 SELECTIVE, SELECTIVITY AND RELATED TERMS IN ANALYTICAL CHEMISTRY
(Recommendations for the Usage of)
PAC **55,** 553–556 (1983).

The scope is clear from the title.

*Typical terms:* interference; selective; specific; resolution.

A.10 pH
(Definition of pH Scales, Standard Reference Values, Measurement of pH and Related Terminology)
PAC **55,** 1467–1476 (1983).

This *provisional* document deals with definitions, procedures, and terminology for the quantity pH.

*Typical terms:* pH; primary pH standard; glass electrode error; residual liquid junction (potential) error.

A.11 *IN SITU* MICROANALYSIS.
(Nomenclature, Symbols and Units Recommend for)
PAC **55,** 2023–2027 (1983).

The report is a continuation of the project published as A.5 and is in part complementary to recommendations given in the publications P.1, A.1, and A.6. It is concerned with terms used in the direct analytical investigation and characterization of the microstructural domains of a solid by focused beams of particles and radiation. Standard names of techniques and general nomenclature (including acronyms) are given.

*Typical terms:* electron probe microanalysis (EPMA); reflection high energy electron diffraction (RHEED); laser micro emission spectroscopy (LAMES); primary electrons (PE); back scattered electrons (BSE); beam current; lateral resolution.

A.12 MOLECULAR LUMINESCENCE SPECTROSCOPY
(Nomenclature, symbols, Units and their Usage in Spectroscopic Analysis—VI.)
PAC **56,** 231–245 (1984).

This report includes a wide range of spectroscopic and photochemical terminology also covered in earlier reports by other Commissions.

*Typical terms:* quantum yield; quantum efficiency; intersystem crossing; luminescence quenching; radiative transition; gated photodetector.

## Other reports nearing completion

P.a ELECTRON SPECTROSCOPIES
(Descriptive Classification of the)

P.b OPTICAL SPECTROSCOPY
(Names, Symbols, Definitions and Units of Quantities in)

P.c CHIROPTICAL TECHNIQUES: NOMENCLATURE, SYMBOLS, UNITS

P.d ABSOLUTE ELECTRODE POTENTIAL

I.a NOMENCLATURE OF INORGANIC CHEMISTRY
(Definitions noted during the course of the revisions of the 'Red Book')

O.a ORGANIC PHOTOCHEMISTRY

O.b STEREOCHEMICAL TERMINOLOGY

A.a KINETIC METHODS OF ANALYSIS
(Nomenclature of)

# IUPAC – SPONSORED CONFERENCES

## International Symposium on Characterization and Analysis of Polymers, "Polymer 85", Melbourne, Australia, 11–14 February 1985.

This symposium will be held in the Phillip Law Building of the Chisholm Institute of Technology, about 10 km from the centre of Melbourne. Inexpensive student style accommodation has been reserved at Normanby House, Monash University, whilst a wide range of hotel and motel accommodation is available in central Melbourne within 20 minutes' travel by public transport. The registration fee for the symposium is $Aust. 200 and a $50 discount is applicable to members of their national chemical societies. A late fee of $35 applies for applications received after 1 December 1984.

POLYMER 85 is the first IUPAC-sponsored meeting on polymers to be held in Australia. The programme includes 16 invited review lectures and over 100 contributions are expected as short papers and poster presentations. In addition there will be an extensive book and instrument exhibition. The main themes to be developed at POLYMER 85 are:

1. Instrumental Methods in Polymer Characterization,
2. Analysis of Industrial Polymers,
3. Characterization in Polymer Material Science,
4. New Polymer Technologies.

Topics of scientific sessions include — FTIR, chromatography, X-ray and neutron techniques, mass spectrometry, NMR, thermal analysis, conformational analysis, analysis of polyolefins and PVC, characterization of rubbers and surface coatings, rheology and processing, degradation and weathering, analysis of monomers, oligomers and additives, molecular weight determination, composites and blends, adhesion and surfaces, electrical properties, dynamic mechanical properties, fracture mechanics, morphology and crystallinity, polymer liquid crystals, biologically active polymers, ion-exchangers and flocculants, polymeric catalysts, and polymer education.

The *invited lectures* will be:

Applications of solubility parameters and other cohesion parameters in polymer science and technology (A.F.M. Barton, Australia)

**Melbourne's major thoroughfare, Collins Street, with its famous tramcar system *(photo courtesy of Photo-Melbourne Tourism Authority)***

Characterization of rodlike macroions by photon correlation and total intensity light scattering (G.C. Berry, USA)

Optical methods for characterization of degradation and stabilization of polymers (N.C. Billingham, UK)

Conformational analysis of chiral polymers in solution (F. Ciardelli, Italy)

Synthesis, characterization, modification and degradation of polymer surfaces as revealed by ESCA (D.T. Clark, UK)

Characterization of solid polymers by luminescence techniques (G.A. George, Australia)

Recent advances in the characterization and analysis of polymers and polymer particles by size exclusion chromatography (A.E. Hamielec, Canada)

Chemical and spectroscopic methods for characterizing copolymer structure (H.J. Harwood, USA)

Some applications of Rayleigh scattering to multicomponent polymer systems (H. Inagaki, Japan)

Recent advances in FT-IR for polymer characterization (J.L. Koenig, USA)

The characterization of thermotropic liquid crystal polymers (R.W. Lenz, USA)

Thermotropic liquid crystalline polymers — Problems and perspectives (N. Platé, USSR)

Carbon-13 NMR of polymers (J.C. Randall, USA)

Synthesis, structure and properties of liquid crystalline polymers (H. Ringsdorf, FRG)

Structural defects in polymers — Their identification and significance (D.H. Solomon, Australia)

Carbon-13 NMR studies of the structures and polymerization mechanisms of poly(vinyl chloride) and related copolymers (W.H. Starnes, USA)

On the Sunday before the Symposium starts, an intensive workshop on NMR applied to polymers will be held at Normanby House for which a fee of $Aust. 25 is charged for Symposium registrants.

February in Melbourne is usually hot and sunny, with average daily temperatures between 15° and 25°C, but some days may be very hot. Rain is unlikely.

---

# RECENT REPORTS

## Nomenclature for regular single-strand & quasi-single-strand inorganic and coordination polymers *(Recommendations 1984)*

The fundamental principles of polymer nomenclature, which were developed to provide a frame-work for the unambiguous systematic naming of single-strand organic polymers, are extended to embrace inorganic and coordination polymers. The structures treated are regular single-strand polymers, that is polymers comprising repeating units linked exclusively through single atoms, and regular quasi-single-strand polymers, in which each repeating unit terminates at a single atom on one side but at a plurality of atoms on the other.

The name of the polymer is the name of the constitutional repeating unit (CRU) prefixed by the terms “poly”, “*catena*”, or other appropriate structural indicator, the CRU in turn being named by citing, in order of appearance along the chain, of its constituent sub-units, which are the largest structural fragments of the CRU that can be named according to established principles of inorganic and/or coordination nomenclature.

The document contains rules for the identification and orientation of the CRU, and it contains many examples of inorganic/coordination polymer structures together with the recommended names. It was prepared by Commissions IV.1 and II.2 and is scheduled for publication in PAC, January 1985.

## Test data for normal coordinate calculations

Input data for testing normal coordinate analysis programs and the results of calculation (G and F matrices, eigenvalues, normal frequencies in $cm^{-1}$, eigenvectors, potential energy distributions and the Jacobian matrix) are given for four representative molecules, namely, $H_2O$, $CH_4$, $CH_3CN$ and $Cl_2CCH_2$.

This report by Commision I.5 is expected to be published in PAC in January 1985.

## Names, symbols, definitions and units of quantities in optical spectroscopy *(Recommendations 1984)*

This document gives definitions and recommended names and symbols for the quantities used in the practice of optical spectroscopy (ultraviolet, visible and infrared). An earlier document prepared by our two Commissions (I.5 and VII.2) was entitled *Quantities and Units in Clinical Chemistry. Optical Spectroscopy Part 1. Theoretical Outline and General Quantities (Provisional Recommendations),* IUPAC Information Bulletin 1978, No. 3, p. 241–259. That document was fully comprehensive, and it was considered that for easy reference a shorter and simplified version would be welcomed.

The arrangement follows that of the provisional document. After a general introduction explaining the recommendations, the major part of the document is a series of sections, each devoted to one of seventeen widely used quantities in molecular spectroscopy. For each quantity there is a definition, a symbol, dimensions and name and symbol of the coherent unit in the SI system. The commonly used multiples of the coherent SI unit are listed together with the corresponding symbols. Alongside are given the commonly used non-SI units which are intended for use when reading older literature. Each section gives common synonyms and other symbols which have been used for the quantity being described, and the choice recommended is justified. Remarks are also given, where appropriate, on the interrelation of symbols.

The recommendations conclude with a summary list of the quantities described with symbols, SI units and dimensions, and a bibliography of documents referred to in the text.

This is a joint report from Commissions I.5 and VII.2 and is scheduled for publication in PAC in January 1985.

## Standard potentials of amalgam electrodes in aqueous solutions, temperature coefficients and activity coefficients of metals in mercury

A review of the literature data of standard potentials of amalgam electrodes and related thermodynamic functions is presented. The amalgams of alkali metals, of the alkaline earth metals, of the Group IIB metals and of the Group IIIA metals are considered, for which data are available based on reversible measurements of the general cell: Pt/$Me_xHg_{1-x}$/$MeCl_z$,aq/AgCl/Ag/Pt, often supplemented by reversible e.m.f. measurements of metal concentration cells of the types: Pt/Me/$MeCl_z$,non-aq/$Me_xHg_{1-x}$/Pt or Pt/$Me_{x''}Hg_{1-x''}$/$MeCl_z$,non-aq/$Me_{x'}Hg_{1-x'}$/Pt.

After a brief introduction concerning the definition and the choice of the standard state for the metal in dilute amalgams, the method for obtaining the standard potentials of these electrodes is described. It implies a double linear extrapolation procedure both with the concentration, $m$, of the electrolyte solution, and the mole fraction, $x$, of the metal in the amalgam. As the collected data are mainly in the temperature range from 283.15 to 343.15 K, the standard aqueous amalgam electrode potentials are reported together with their corresponding temperature coefficients; hence the standard thermodynamic functions for the amalgam species Me+Hg and those for the amalgamation reactions are obtained. In addition are reported the standard aqueous potentials, and their related thermodynamic functions, for the $Me^{z+}$/Me couple of pure lithium, sodium, potassium, indium, thallium and cadmium.

The most reliable data are then correlated as a function of the temperature with polynomial equations, whose coefficients are also reported. The smoothed values obtained from these equations are therefore recommended as the best values. The same smoothing procedure has been applied to the $Q$ coefficient of the equation: $\log f_{Me} = Qx_{Me}$, on which is based the calculation of the activity coefficient of the metal in the amalgam. It is to be pointed out that the recommended values for $Q$ are strictly within the experimental range of composition of the amalgam used for its determination. The document contains also a brief review of the kinetic data available for the amalgam electrodes considered, in order to support the reversibility of the systems treated.

This Commission V.5 report is scheduled for publication in PAC in January 1985.

# OTHER PEOPLE'S PUBLICATIONS

## ICSU Scientific Committee on Problems of the Environment (SCOPE)

**SCOPE Newsletter No. 21, May 1984.** Address by Prof. A. K. Sharma to the SCOPE Open Session, New Delhi, February 1984. Report of 15th meeting of the Executive Committee at which six advisory Working Groups were constituted — Biogeochemical Cycles, Land Transformation, ENUWAR, Publications, Ecotoxicology, and New Projects. Programme for period up to September 1985 (under the heading Biogeochemical Cycles is included work on nitrogen cycles, acid deposition, metals (As, Hg, Ca and Pb) cycling, carbon and carbon dioxide, and sulphur cycles).

### SCOPE Report 19: The Global Biogeochemical Sulphur Cycle.

This book, edited by M. V. Ivanov and J. R. Freney, focuses attention on the poorly investigated problems of the global biogeochemical sulphur cycle and opens the way for further study. It examines the possible long-term effects on the stratospheric sulphate layer and the consequent effects on climate. It assesses the natural and anthropogenic components of the individual fluxes and the interaction of the sulphur cycle with the cycles of several other elements.

Information on the concentrations of the various forms of sulphur in separate reservoirs and geospheres is presented and assessments of fluxes, both natural and man-made, between geospheres are provided. Prior to intervention by man, sulphur in sediments and rocks entered the sulphur cycle slowly by the natural weathering processes. Since the industrial revolution, lithospheric sulphur has been released into the atmosphere rapidly and in increasing amounts by the combustion of fossil fuels and by various industrial and metallurgical processes. This book demonstrates that man-made emissions are seriously interfering with the global biogeochemical sulphur cycle and can have harmful effects on man and the environment. High concentration of sulphur dioxide and sulphate aerosols can cause health problems and sulphur dioxide can corrode metals and damage buildings, agricultural crops and soils. Sulphur can also enter the biosphere in sewage from mining and industrial units and in the drainage water from fields where fertilizers are used intensively. The effects of acid rain on lakes, rivers and soils are not well known. These inputs result in a concentration of sulphur in freshwater basins which can lead to the contamination of water bodies with the toxic substance hydrogen sulphide.

SCOPE Reports, except No. 7, can be obtained from John Wiley & Sons Ltd, Baffins Lane, Chichester, Sussex, PO19 1UD, UK.

## International Association of Cereal Science and Technology (ICC)

**ICC Newsletter No. 3/August 1984.** Changes in Executive Committee membership and Working Group Chairmen as from the ICC General Assembly, June 1984. Definitive standards adopted. Change of President, now Dipl.Ing. Kjell M. Fjell, and Vice-President, now Prof. M. Jankiewicz. Change of name to 'International Association for Cereal Science and Technology' but retention of abbreviation 'ICC'.

## International Federation of Clinical Chemistry (IFCC)

**IFCC News, No. 37, 1984/2.** Notes on Prof. Paul Astrup and Prof. Per Lous, recipients of IFCC Awards. Report on the 1984 Council Meeting. Projects involving IFCC and developing countries. Bibliography on safety in clinical laboratories.

## International Union of Nutritional Sciences (IUNS)

**IUNS Newsletter No. 11, June 1984.** Details of the 13th International Congress of Nutrition, Brighton, UK, 18–23 August 1985, including titles and presenters of keynote lectures and notes on the subjects planned for symposia and colloquia. Lists of IUNS publications and reports received. Reports on the 4th Asian Congress of Nutrition, the CIOMS 17th Round Table Conference on 'Biomedical Research Involving Animals' and on 'Nutrition and Cancer'.

## International Union of Pure and Applied Biophysics (IUPAB)

**IUPAB News, September 1984.** Reports on the meetings of the IUPAB Council and General Assembly held in Bristol, UK, July/August 1984, including the reports of the President and Secretary General. The new Secretary General is Prof. Joseph Tigyi, 12 Szigeli-u, 7643 Pésc, Hungary.

---

# SUMMARY MINUTES OF COMMITTEE AND COMMISSION MEETINGS

## Inorganic Chemistry Division Executive Committee: Boulder, Colorado, USA, 31 July 1984

### Contingency fund 1984/85

The Inorganic Chemistry Division received in 1984 a better proportion of the total fund than in 1983 (budget letter of March 27, 1984). Commission II.2 will have US$1250 available in addition to the amount which was originally provided. Also Commission II.3 will be granted additional funds.

### International Conferences sponsored by IUPAC in 1984 and 1985

The following Conferences will be sponsored by IUPAC for 1984 and 1985:

9th International Conference on Non-aqueous Solutions, Pittsburgh, Pennsylvania, USA, 13 – 17 August 1984

International Conference on Defects in Insulating Crystals, Salt Lake City, Utah, USA, 20 – 24 August 1984

1st International Symposium on Solubility Phenomena, London, Ontario, Canada, 21 – 23 August 1984

Fifth International Symposium on Hydrogen in Metals, Belfast, Northern Ireland, UK, 26 – 29 March 1985
International Conference on the Theory of the Structures of Non-crystalline Solids, Bloomfield Hills, Michigan, USA, 3 – 6 June 1985
7th International Symposium on Solute-Solute-Solvent Interactions, Reading, UK, 15 – 19 July 1985
International Symposium on Application of Mathematical Concepts to Chemistry, Dubrovnik, Croatia, Yugoslavia, 26 – 29 August 1985
12th International Conference on Organometallic Chemistry, Vienna, Austria, 8 – 13 September 1985
International Conference on the Application of the Mössbauer Effect, Leuven, Belgium, 16 – 20 September 1985 (not approved)

**Coincidence of dates for the International Conference on Organometallic Chemistry in Vienna, Austria, and the IUPAC Congress in Manchester, 1985**
The coincidence of dates for Conferences sponsored by IUPAC and IUPAC Congresses will be brought before the Bureau by the Division President. The Executive Officers of Division II agree that dates which are proposed can be changed only after contacting the IUPAC Secretariat in Oxford.

**Initial Programme, Lyon, 1985**
The following dates are proposed for the IUPAC General Assembly in Lyon, 1985:
30 August: Inorganic Chemistry Division, Committee Meeting
31 August: Inorganic Chemistry Division Meeting
1 September: Open Meeting of the Inorganic Chemistry Division
Commission II.2 will meet from 27 August through 1 September.
The joint meeting with the Commission on the Nomenclature of Organic Chemistry will take place on 28 August. The dates will overlap with the meeting of IDCNS, but will allow the members of Commission II.2 to participate in the election of new Division Committee members.

**Elections for Division Committee in Lyon, 1985**
The Bureau will decide whether an additional member of the Division Committee will be restored. Dr. J. Hlaváč cannot be elected unless he becomes Secretary.

**Miscellaneous**
a) Prof. Roth will be provided with funds for participation in the Commission of Radioanalytical Chemistry and Nuclear Techniques (V.7) as the representative of Division II.
b) The question whether the *CRC Handbook of Chemistry and Physics* can obtain thermal conductivity and similar data from bodies of Division II will be brought up in the Bureau by the President.
c) The next meeting of the Executive Officers of the Division is expected to be held on 26 April 1985 in Chicago, USA.

**E. Fluck**

---

## Commission IV.2 — Polymer Characterization and Properties. Working Party on Molecular Characterization of Commercial Polymers: Gothenburg, Sweden, 18 May 1984

The Working Party met at Chalmers University of Technology in Gothenburg, Sweden. The number of participants was 15.

Results from round robin measurements on three linear low density polyethylene samples with different comonomers were discussed, with special attention to the results from the various fractionations performed on one of the samples. Different fractionation methods were used by different laboratories, such as TREF fractionation on fibers (Penning's method), TREF fractions (Wild & Ryle), crystallization fractionations and direct fractionations. The fractions obtained have been characterized using GPC, IR, DSC and NMR techniques. Some laboratories also fractionated an earlier investigated LDPE sample (Iupac β) and these fractions have also been analyzed using the techniques mentioned above.

The future programme will involve different fractionations of the two other LLDPEs (with other comonomer types) and analyses of the obtained fractions with all available molecular characterization methods. The next meeting will be held in Paris on 26 April 1985.

**P. Stark**

---

## Commission IV.2 — Polymer Characterization and Properties. Working Party on Kinetic Parameters for Free-radical Polymerization: Mainz, FRG, 10 – 11 April 1984

A meeting of the Working Party was held at Johannes-Gutenberg University, Mainz. The Chairman reported that active membership is now reduced to ten participants. The reduction in membership meant that no member is currently working on the polymerization of styrene and it was accepted that this part of the programme should be abandoned. Work on the polymerization of methyl methacrylate will be completed. It was ascertained that four data sets for polymerizations at each of 50, 60 and 70°C will be available by the Summer of 1984. It was agreed that laboratories will complete the current experimental programme by the summer of 1984 in order that analysis of the data can be completed and reports prepared for the General Assembly in 1985. It was proposed that the present programme should then be terminated and be replaced by a new programme to be agreed.

A detailed discussion was held on the densities of monomer and polymer solutions relevant to the determination of shrinkage factors, to be used in analysing dilatometric rate data. At least five data sets will be available for analysis. Shrinkage factors to be used in analysing rate data will be obtained by regression analysis of the combined data. A first publication from the Working Party, based on these data, will be prepared defining the shrinkage factors recommended for use in converting dilatometric rate. The paper will also give an assessment of errors involved in the density determinations, likely sources of error and acceptable limits. Corrections necessary to allow for effects of high initiator concentrations will be included. The draft will be prepared by midsummer 1984.

Several problems relating to the acquisition and analysis of rate data were discussed, including monomer purification and storage and the consequences of the finite times necessary to attain thermal equilibrium. Problems associated with polymer characterization by GPC were discussed in detail and comparisons were made between theoretical and experimental molecular weight distributions. Errors are inherent in the chromatograms, especially at the ends, due to instrumental limitations and possible loss of low molecular weight polymer on isolation. Additional errors also arise from polymer generated during the approach to thermal equilibrium. Excellent agreement between experimental and theoretical molecular weight distributions for polystyrene can be achieved if the theoretical distribution is compared with an average derived from three to four separate experimental distributions for the same polymer. Recommendations were made as to the form in which data should be submitted for analysis. In analysing the data according to the recommended procedure a search will be made for the combination of kinetic parameters which give the best fit between experimental and theoretical distributions, within the constraints of the kinetic model assumed. A second paper will be prepared based on the rate and molecular weight data and presenting the "best values" of the kinetic parameters. This paper will present experimental details on monomer purification procedures, dilatometric processes employed, etc., in addition to the results of the data analysis. It is anticipated that separate publications describing the actual data analysis procedures will be prepared by their devisers, although the essential features will be included in the second paper.

This Working Party is the only one in the Macromolecular Division associated with synthetic processes and serious consideration was given to the possibility of continuing an activity in this area when the current programme terminates in 1985. It was generally accepted that it would be unrealistic to propose another programme along the lines of the current one which had called for purely scientific experiments to be undertaken which would not otherwise have been performed in the participating laboratories. This demand caused problems in maintaining an active group. Any future programme should be undertaken only if such problems can be avoided. Members felt that people will only willingly undertake experiments which they would have done irrespective of any IUPAC activity or which would only involve putting a few extra samples through a standard instrumental procedure. Discussion therefore concentrated on non-experimental projects and focussed on computer-based projects which would model polymerization processes in various ways.

A problem which has beset the study of polymerization kinetics from the outset and which was encountered as a serious problem in the current programme is the accurate determination of molecular weights and molecular weight distributions. These distributions contain a tremendous amount of important information relevant to the understanding of polymerization mechanisms which, if it could be reliably extracted, would greatly assist the assessment and interpretation of data. The meeting recommended making a proposal that a programme be established to examine the modelling of polymerization reactions with the aid of kinetic data and characterization techniques (e.g. GPC, light scattering, etc.).

## **Commission V.6 — Equilibrium Data:** Boulder, Colorado, USA, 30 July 1984

The meeting was attended by six Commission Members and five Observers. The main items for discussion were the following:

**(1) Critical Survey of Stability Constants.** A progress report on the various projects was presented, to be considered further in Lyons in 1985.

**(2) Compilation of Stability Constant Data.** A progress report was presented and questions raised concerning format, nomenclature and computer searching. It was agreed to hold an informal meeting of those concerned in Paris during the autumn of 1984 to resolve some of the problems.

**(3) Other projects** discussed included:

(a) Rationalization of ion-exchange data,
(b) Metal complex equilibria with polyelectrolytes, and
(c) Computerization of data on dissociation constants of acids and bases.

**(4) Standard State Pressure.** The Commission members did NOT support the recommended change for the standard pressure from 1 atmosphere (1.013 bar) to 1 bar since such a change could affect seriously emf and pH measurements, hence values for stability constants, etc.

**L. D. Pettit**

## **Commission VI.3 — Oils, Fats and Derivatives:** Turku, Finland, 21–23 August 1984

The meeting was held at the University of Turku. Forty delegates, representing 17 countries and six international organizations, were present.

Reports on the activities of the Commission's 18 Working Groups were discussed and it was agreed that eight of them would arrange further collaborative studies for the working year 1984/85. The methods being studied are for the determination of:

emulsifiers, thiobarbituric acid, *n*-3 polyenoic acids, solvent residues in oils, butyric acid (two procedures), tocopherols (by HPLC) and methods for phospholipids.

The study of three new methods has been completed and the methods adopted:

Qualitative and quantitative determination of phospholipids;
Total and free hexane residues in oilseed cakes;
Traces of copper, iron and nickel in edible oils and fats.

During 1984/85 *ad hoc* groups will consider the possibility of determining lead and other toxic metals in edible oils and the detection of the adulteration of olive oils by semi-drying oils.

The texts of the following new methods previously adopted by the Commission are now almost ready for publication as standard methods:

Determination of erythrodiol;
Determination of total sterols (enzymatic procedure);
Detection of mineral oil in animal and vegetable oils & fats;
Determination of triglycerides (by gas-liquid chromatography).

**W. D. Pocklington**

---

# IUPAC CONFERENCES

Additional information from address in parentheses

## 1985

### POLYMER ANALYSIS

**February 11–14. POLYMER 85: Characterization and Analysis of Polymers. Melbourne, Australia.**
**(Dr. J. H. O'Donnell, Polymer & Radiation Group, Department of Chemistry, University of Queensland, Brisbane 4067, Australia.)**

### HYDROGEN IN METALS

**March 26–29. 5th International Symposium on Hydrogen in Metals. Belfast, UK.**
**(Dr. F. A. Lewis, Department of Chemistry, David Keir Building, The Queen's University of Belfast, Belfast, BT9 5AG, Northern Ireland, UK.)**

### COMPOUNDS OF TRANSITION ELEMENTS

**April 9–13. 8th International Conference on Solid Compounds of Transition Elements. Vienna, Austria.**
**(Gesellschaft Österreichischer Chemiker, VIII SCTE, Eschenbachgasse 9, A-1010 Wien, Austria.)**

### ANALYTICAL CHEMISTRY

**April 15–19. 2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Pretoria, RSA.**
**(Dr. A. Strasheim, Department of Chemistry, University of Pretoria, Pretoria 0002, Republic of South Africa).**

### NONCRYSTALLINE ORDER IN POLYMERS

**May 27–30. International Symposium on Noncrystalline Order in Polymers. Naples, Italy.**
**(Prof. A. Sirigu, Dipartimento di Chimica, Universita di Napoli, Via Mezzocannone 4, I-80134 Napoli, Italy.)**

### BIOORGANIC CHEMISTRY

**June. 1st International Symposium on Bioorganic Chemistry. New York City, NY, USA.**
**(Prof. R. Breslow, Department of Chemistry, Columbia University, New York, NY 10027, USA.)**

### NON-CRYSTALLINE SOLIDS

**June 3–6. International Conference on the Theory of the Structures of Non-crystalline Solids. Bloomfield Hills, Michigan, USA.**
**(Prof. H. F. Schaefer III, Department of Chemistry, University of California, Berkeley, California 94720, USA.)**

### POLYMER COMPOSITES

**July 8–11. 28th Microsymposium on Macromolecules: Polymer Composites. Prague, Czechoslovakia.**
**(Dr. P. Cefelin, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 1888 Petriny, Prague 6, Czechoslovakia.)**

### ORGANOMETALLIC CHEMISTRY

**July 12–15. 3rd International Symposium on Organometallic Chemistry directed toward Organic Synthesis. Kyoto, Japan.**
**(Prof. H. Nozaki, Department of Industrial Chemistry, Kyoto University (Kogaku-Bu), Yoshida, Kyoto, 606 Japan.)**

### AROMATIC COMPOUNDS

**July 15–19. 5th International Symposium on Novel Aromatic Compounds. St. Andrews, UK.**
**(Dr. P. J. Garratt, Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, UK.)**

### SURFACE AND COLLOID SCIENCE

**June 24–28. 5th International Conference on Surface and Colloid Science, Potsdam, NY, USA.**
**(Prof. E. Matijević, Institute of Colloid and Surface Science, Clarkson University, Potsdam, NY 13676, USA.)**

### PLASMA CHEMISTRY

**July 1–5. 7th International Symposium on Plasma Chemistry. Eindhoven, Netherlands.**
**(Prof. D. C. Schram, Department of Physics, Technische Hogeschool Eindhoven, P.O. Box 513, 5600 MB Eindhoven, Netherlands.)**

### INTERACTIONS IN SOLUTION

July 15–19. 7th International Symposium on Solute-Solute-Solvent Interactions. Reading, UK.
(Dr. A. D. Pethybridge, Department of Chemistry, The University of Reading, Whiteknights, Reading, Berkshire, RG6 2AD, UK.)

### MYCOTOXINS AND PHYCOTOXINS

July 22–25. 6th International Symposium on Mycotoxins and Phycotoxins. Pretoria, RSA.
(Dr. P. S. Steyn, National Chemical Research Laboratory, Council for Scientific and Industrial Research, POB 395, Pretoria 0001, Republic of South Africa.)

### HETEROCYCLIC CHEMISTRY

August 11–16. 10th International Congress of Heterocyclic Chemistry. Waterloo, Ontario, Canada.
(Prof. V. Snieckus, The Guelph-Waterloo Centre for Graduate Work in Chemistry, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.)

### HYDROTHERMAL REACTIONS

August 12–14. 2nd International Symposium on Hydrothermal Reactions. University Park, Pennsylvania, USA.
(Prof. H. L. Barnes, Professor of Geochemistry and Director of Ore Deposits, College of Earth and Mineral Sciences, The Pennsylvania State University, 235 Deike Building, University Park, Pennsylvania 16802, USA.)

### CATIONIC POLYMERIZATION

August 12–15. 7th International Symposium on Cationic Polymerization and Related Processes. Jena, GDR.
(Prof. G. Heublein, Sektion Chemie, Friedrich-Schiller-Universität, DDR–6900 Jena, German Democratic Republic.)

### MACROMOLECULES

August 18–23. 30th International Symposium on Macromolecules. The Hague, Netherlands.
(Dr. J. A. M. Smit, Gorlaeus Laboratories, University of Leiden, Department of Chemistry, P.O. Box 9502, NL-2300 RA Leiden, Netherlands.)

### THERMAL ANALYSIS

August 19–23. 8th International Conference on Thermal Analysis. Bratislava, Czechoslovakia.
(Dr. P. K. Gallagher, Rm 6D-311 Bell Laboratories, Murray Hill, New Jersey 07974, USA.)

### CHEMICAL EDUCATION

August 23–28. 8th International Conference on Chemical Education: Widening the Scope of Chemistry. Tokyo, Japan.
(Prof. J. T. Shimozawa, Secretary General of 8–ICCE, c/o The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

### MATHEMATICS AND CHEMISTRY

September 2–5. International Symposium on Applications of Mathematical Concepts to Chemistry. Dubrovnik, Croatia, Yugoslavia.
(Prof. Lj. Ruščić, Ruder Bošković Institute, PO Box 1016, Bijenička 54, YU-41001 Zagreb, Croatia, Yugoslavia.)

### MARINE NATURAL PRODUCTS

September 2–6. 5th International Symposium on Marine Natural Products. Paris, France.
(Dr. A. Ahond, Institut de Chimie des Substances Naturelles, CNRS, F-91190 Gif sur Yvette, France.)

### VAPOUR-LIQUID EQUILIBRIUM

September 5–7. 2nd International Workshop on Vapour-Liquid Equilibrium in 1–Alkanol + n-Alkane Mixtures. Paris, France.
(Dr. H. V. Kehiaian, Laboratoire de Chimie Organique Physique, Institut de Topologie et de Dynamique des Systèmes, Université Paris VII, 1 rue de la Brosse, F-75005 Paris, France.)

### MASS SPECTROMETRY

September 8–13. 10th International Symposium on Mass Spectrometry. Swansea, UK.
(Prof. J. H. Beynon, Royal Society Research Unit, University College of Swansea, Swansea SA2 8PP, UK.)

### ORGANOMETALLIC CHEMISTRY

September 8–13. 12th International Conference on Organometallic Chemistry. Vienna, Austria.
(Prof. K. Schlögl, Institut für Organische Chemie der Universität, Währinger Strasse 38, A–1090 Wien, Austria.)

### IUPAC CONGRESS

September 9–13. 30th International Congress of Pure and Applied Chemistry. Manchester, UK.
(The Royal Society of Chemistry, Burlington House, London, W1V 0BN, UK.)

### SPECTROSCOPY

September 15–21. 24th Colloquium Spectroscopicum Internationale (CSI XXIV). Garmisch-Partenkirchen, FRG.
(Dr. W. Fritsche, Gesellschaft Deutscher Chemiker, Carl Bosch-Haus, Postfach 900440, Varrentrappstrasse 40–42, D–6000 Frankfurt/Main 90, Federal Republic of Germany.)

### CHEMICAL RESOURCES OF THE OCEAN

September 22–28. Chemical Resources of the Global Oceans — CHEMRAWN IV. Massachusetts, USA.
(J. R. Moore, Director, Marine Science Institute, University of Texas, Austin, TX 78712, USA.)

### MEDICINAL NATURAL PRODUCTS

November 10–13. International Symposium on Organic Chemistry of Medicinal Natural Products. Shanghai, China.
(Prof. Dai Lixin, Shanghai Institute of Organic Chemistry, Academia Sinica, 345 Lingling Lu, Shanghai, China.)

# Farewell to Pergamon — a personal note

As you will have seen elsewhere, this will be the last issue of CI published by Pergamon Press, at least for some time. It was in November 1982 that I was plunged into the world of artwork, Baskerville, bold, captions, copy, cut and paste, em and en rules, italics, light, medium, picas, points, roman, screens, Souvenir, Times, typefaces, Univers — and many more then (and sometimes now) unfamiliar words and phrases. The fact that I did not submerge completely in this sea of jargon and technicalities is due very largely to the patience and assistance of the staff of the Pergamon Journals Production Department — in particular Julie Sullivan, Dick Palmer, Ken Hall and Richard Sumner, my immediate contacts. As an Editor's Farewell to Pergamon I thought you might be interested in a brief word about how we worked together on CI.

It was Julie who first guided my faltering footsteps, initiated me into the rites of marking copy and generally "held my hand" for the first year. Whether this hand-holding had come to the notice of someone who thought it improper I do not know, but the production of CI was moved from Julie to Dick as from the first issue of 1984 (did anybody notice the change of name on the inside front cover?). He it was who enabled me to try out various typefaces and sizes, leading to the greater use of Souvenir light and the introduction of Baskerville and, once, Bembo typefaces, whilst still retaining the major use of Times and Univers for regular items. It would be interesting to know how many of you noticed and, if you did, whether you thought the variations worthwhile! Dick was also largely instrumental in a number of changes and, in my opinion, improvements in presentation. He had, for example, a major part to play in the presentation of the *IUPAC Handbook,* i.e. the fitting of the typeset material to the camera ready copy prepared in the Secretariat.

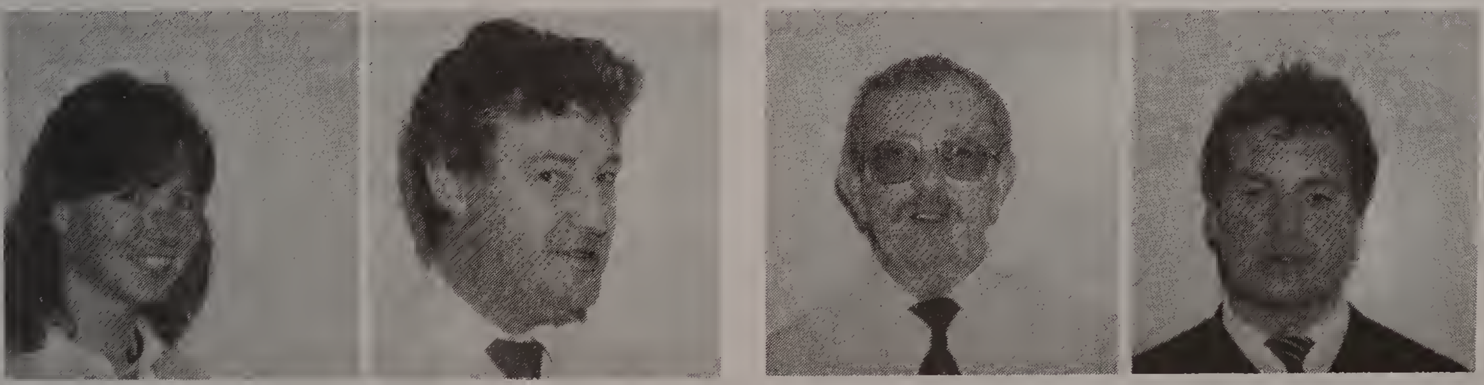
Ken Hall and his staff had the task of interpreting the scribblings of Julie or Dick and, worst of all, myself and converting the typescript copy into the typeset material we wanted for printing. Not only did they obviously take an interest, to judge from the blue marks that appeared on the copy, in what was received on time, but they seemed able somehow not only to fit in the odd bit of new stuff but also to make relatively major corrections at a late stage — and apparently with very good grace. What might have been said out of my hearing is, of course, a different matter!

And who was responsible for all the mistakes? With only one or two exceptions, however temporary and part-time he might have been, the editor must be held responsible — and must be able to think up some plausible explanations.

So much for the words, but what about the pictures? It was Richard Sumner who was able to tell me whether the photographs I proffered were at all suitable for reproduction, either as they were or after enlarging or reducing to the required size (this is where the screens come in!). This was often done at very short notice to fit in with my visits to Pergamon. I must keep the record straight by pointing out that the pictures you see in CI are finally processed by Nuffield Press.

Finally, why was CI usually late? A good question, which defies a simple answer. It is, I think, fair to say that, overall, what with late copy, delays in sub-editing, typesetting, proofreading and printing due to overwork, sickness or machines going wrong, the responsibility can be shared evenly throughout the whole procedure — from contributor, through editor, production editor, etc., and printer, to distributor. At the moment, I am afraid I can't think of an adequate reason for the recipient to be blamed.

**R.W. Fennell**



**Left to right: Julie Sullivan, Dick Palmer, Ken Hall and Richard Sumner — my personal contacts.**

# REVISIONS TO IUPAC HANDBOOK

## CI, 1984, Supplement

Additions and amendments to the *Handbook* between 24 July 1984 and 9 October 1984 are given below.
Additions, new entries, are marked with an asterisk. The affiliation of new members of IUPAC bodies is included.
Amendments are shown by # at the beginning of the line in which the revision occurs.

## MEMBERSHIP LISTS OF IUPAC BODIES

### NATIONAL ADHERING ORGANIZATIONS

| | |
|---|---|
| Federal Republic of Germany | Deutscher Zentralausschuss für Chemie, Postfach 900440,<br>Carl-Bosch-Haus, Varrentrappstrasse 40-42,<br>D-6000 Frankfurt/Main 90, Federal Republic of Germany<br>#(TEL: +49 (69) 79171. TELEX: 412526 GMELI D FÜR GDCH) |
| Republic of South Africa | Council for Scientific and Industrial Research, POB 395,<br>Pretoria 0001, Republic of South Africa<br>#(TEL: +27 (12) 749111. TELEX: 3-21312 SA) |

### OBSERVER COUNTRIES

| | |
|---|---|
| *Ethiopia | Chemical Society of Ethiopia, PO Box 32934, Addis Ababa, Ethiopia |
| *Kuwait | Kuwait Chemical Society, c/o Chemistry Department,<br>Kuwait University, PO Box 5969, Kuwait |

### ASSOCIATED ORGANIZATIONS

| | |
|---|---|
| International Association<br>#for Cereal Science and<br>#Technology | |
| International Federation of Clinical Chemistry | #Dr. M. M. MUELLER (Secretary IFCC),<br>#Second Department of Surgery, Division of Clinical<br>#Biochemistry, Spitalgasse 23, A-1090 Wien, Austria |
| International Society of Electrochemistry | #Prof. M. BREITER (Secretary General ISE),<br>#Technische Universität Wien,<br>#Getreidemarkt 9, A-1060 Wien, Austria |

### CHEMRAWN COMMITTEE
(Established 1976)

#Dr. B. W. Rossiter (1976-1986)
Chairman
#Dr. R. H. Marchessault (1984-1988)
Secretary

#### Member

#Prof. W. J. Beek (1984-1988)

#### Associate Member

*Prof. E. Grzywa (1984-1988)

### COMMISSION ON CHEMICAL KINETICS (I.4)
(Established 1983)

#### Associate Members

*Dr. W. Klein (1983-1987)
*Prof. Yu. N. Molin (1983-1987)

MACROMOLECULAR DIVISION (IV)
(Established 1967)

Coopted Member

#Prof. B. Rånby

#COMMISSION ON RADIOCHEMISTRY
#AND NUCLEAR TECHNIQUES (V.7)

CLINICAL CHEMISTRY DIVISION (VII)
(Established in its present form 1979)

Representatives of IFCC (from 1 January 1985)

#Dr. D. S. Young
President
#Dr. M. M. Mueller
Secretary

## ALPHABETICAL INDEX TO MEMBERS OF IUPAC BODIES

*ALBERS, Dr. M. O., c/o National Chemical Research Laboratory, Council for Scientific
and Industrial Research, PO Box 395, Pretoria 0001, Republic of South Africa (19)
(TELEX: 3-21312 SA) (19)
National Representative II.2 (1984-1985)

*BARAN, Dr. E. J., Nuestra Senora de la Guardia No. 326, 1876 Bernal, Argentina (20)
National Representative II.3 (1984-1985)

*BRENNER, Prof. R. R., Canning 3020, Piso 23-B 1425, Buenos Aires, Argentina (33)
National Representative VI.3 (1984-1985)

*BREITER, Prof. M., Technische Universität Wien, Getreidemarkt 9, A-1060 Wien, Austria (7)
Secretary General ISE

*GRZYWA, Prof. E., Ministry of Chemical and Light Industries, Council of Ministers,
ul. Wspolna 4, PL-00 505 Warszawa, Poland (10)
Associate Member CHEMRAWN (1984-1988)

*KHALDNA, Dr. Yu. L., Institute of Chemistry, Estonian Academy of Sciences,
Akademiya tea 15, SU-200026 Tallin, USSR (28)
National Representative V.3 (1984-1985)

*LEROY, Prof., École Nationale Supérieure de Chimie, 1 rue Blaise Pascal,
F-67000 Strasbourg, France (27)
National Representative V.2 (1984-1985)

*MACCHI, Dr. E. M., Avenida 53 No. 790, 1900 La Plata, Argentina (24)
National Representative IV.1 (1984-1985)

*MUELLER, Dr. M. M., Second Department of Surgery, Division of Clinical Biochemistry,
Spitalgasse 23, A-1090 Wien, Austria (3, 35)
Secretary IFCC; Representative of IFCC on Div. VII

*SŌMIYA, Prof. S., Research Laboratory of Engineering Materials, Tokyo Institute of
Technology at Nagatsuta, Nagatsuta-cho, Midori-ku, Yokohama 227, Japan (20)
National Representative II.3 (1984-1985)

Amendments:

#BEEZER, Dr. A. E., Department of Chemistry, Bourne Laboratory, Royal Holloway
#and Bedford Colleges, Egham Hill, Egham, Surrey TW20 OEX, UK (13)

BEHRENS, Prof. D., DECHEMA, Postfach 970146, Theodor-Heuss-Allee 25,
D-6000 Frankfurt/Main 97, Federal Republic of Germany
#(TEL: +49 (69) 756 4235. TELEX: 0412490 D) (5)

#BHARDWAJ, Dr. I. S., Central Institute of Plastics Engineering and Tools,
#Guindy, Madras 600032, India
#(TEL: +91 (44) 432371-4) (24)

#BORZANI, Prof. W., Instituto Mauá de Tecnologia, Centro de Pesquisas,
#Estrada das Lágrimas 2035, 09500 São Caetano do Sul - SP, Brazil
#(TEL: 442 1900) (32)

BULL, Dr. J. R., National Chemical Research Laboratory, Council for Scientific
and Industrial Research, PO Box 395, Pretoria 0001, Republic of South Africa
#(TEL: +27 (12) 869211. TELEX: 3-21312 SA) (21)

BUSCHBECK, Dr. K. Ch., Gmelin-Institut für Anorganische Chemie und Grenzgebiete der
Max-Planck-Gesellschaft, Carl Bosch Haus, Postfach 900467, Varrentrappstrasse 40-42,
D-6000 Frankfurt/Main 90, Federal Republic of Germany
#(TEL: +49 (69) 791 7215. TELEX: 412526 GMELI D) (19)

#CALADO, Prof. J. C. G., School of Chemical Engineering, Cornell University,
#Olin Hall, Ithaca, New York 14853, USA (16)

CLARK, Dr. J. B., National Institute for Materials Research, Council for Scientific
and Industrial Research, PO Box 395, Pretoria 0001, Republic of South Africa
#(TEL: +27 (12) 869211. TELEX: 3-21312 SA) (20)

DYBKAER, Dr. R., Department of Clinical Chemistry, Frederiksberg Hospital,
Nordre Fasanvej 59, DK-2000 København F, Denmark
#(TEL: +45 (1) 34 77 11) (36)

EISENBERG, Prof. H., Department of Polymer Research, Weizmann Institute of Science,
Rehovot 76100, Israel
#(TEL: +972 (54) 83252. TELEX: 361900 WIX IL) (13, 23)

#FAULKNER, Prof. L. R., Department of Chemistry, University of Illinois,
#1209 West California Street, Urbana, Illinois 61801, USA
#(TEL: +1 (217) 333 8306) (16)

FLEISSNER, Dr. M., Hoechst AG, Kunststoff Forschung H, Postfach 800320,
D-6230 Frankfurt/Main 80, Federal Republic of Germany
#(TEL: +49 (69) 3053422. TELEX: 41234-0 HOEAG D) (24)

FLUCK, Prof. E., Gmelin-Institut für Anorganische Chemie und Grenzgebiete der
Max-Planck-Gesellschaft, Carl Bosch Haus, Postfach 900467, Varrentrappstrasse 40-42,
D-6000 Frankfurt/Main 90, Federal Republic of Germany
#(TEL: +49 (69) 791 7210. TELEX: 412526 GMELI D) (11, 19)

#FREHSE, Dr. H., Bayer AG, PF-A/CE-RA, Pflanzenschutzzentrum Monheim,
#D-5090 Leverkusen-Bayerwerk, Federal Republic of Germany
#(TEL: +49 (2173) 383761. TELEX: 85 103-275 BY D) (10, 32)

FRITSCHE, Dr. W., Gesellschaft Deutscher Chemiker, Carl Bosch Haus, Postfach 900440,
Varrentrappstrasse 40-42, D-6000 Frankfurt/Main 90, Federal Republic of Germany
#(TEL: +49 (69) 791 7320. TELEX: 412526 GMELI D FÜR GDCH) (5, 12)

#GEARY, Dr. T. D., Division of Clinical Chemistry, Institute of Medical and
#Veterinary Science, PO Box 14, Rundle Street, Adelaide, Southern Australia 5000,
#Australia
(TEL: +61 (8) 2287911. TELEX: AA82647 MEDVET) (35)

GILES, Jr., Dr. P. M., Chemical Abstracts Service, POB 3012, 2540 Olentangy River Road,
Columbus, Ohio 43210, USA
#(TEL: +1 (614) 421 3718. TELEX: 684-2086) (21)

GORBACH, Dr. S., Hoechst AG, Analytisches Laboratorium, Postfach 800320,
D-6230 Frankfurt/Main 80, Federal Republic of Germany
#(TEL: +49 (69) 3056012. TELEX: 41234-0 HOEAG D) (32, 33)

GRIES, Dr. W., National Institute for Materials Research, Council for Scientific
and Industrial Research, PO Box 395, Pretoria 0001, Republic of South Africa
#(TELEX: 3-21312 SA) (27)

GUILBAULT, Prof. G. G., Department of Chemistry, University of New Orleans,
Lake Front, New Orleans, Louisiana 70122, USA
#(TEL: +1 (504) 286 6323) (27, 28)

#HARTMANN, Dr. A., Rothschild Bank AG, Zollikerstrasse 181, CH-8034 Zürich, Switzerland
(TEL: +41 (1) 384 71 11. TELEX: 558511 CH) (12)

HOFACKER, Dr. URSULA, Gesellschaft Deutscher Chemiker, Carl Bosch Haus, Postfach 900440,
Varrentrappstrasse 40-42, D-6000 Frankfurt/Main 90, Federal Republic of Germany
#(TEL: +49 (69) 791 7326. TELEX: 412526 GMELI D FÜR GDCH) (11)

#JORDAN, Prof. J., Department of Inorganic and Analytical Chemistry,
#Hebrew University of Jerusalem, Givat Ram Campus, Jerusalem 91904, Israel
#(TELEX: 25391 HU IL) (29) [until March 1985]

#KAPLAN, Prof. MARIA A. C., Rua Xavier da Silveira, 115 ap 504, 22061 Copacabana,
#Rio de Janeiro - RJ, Brazil (21)

KAPOOR, Prof. R. C., Department of Chemistry, University of Jodhpur,
#Jodhpur-342003, India
(TEL: 20740) (29)

KEMPE, Prof. G., Technische Hochschule "Carl Schorlemmer" Leuna-Merseburg,
#Otto-Nuschke-Strasse, DDR-4200 Merseburg 6, German Democratic Republic
#(TEL: +37 (442) 462007. TELEX: 471320 THLM DD) (11)

#KERTES, Prof. A. S., Department of Chemical Engineering, University of California,
#Berkeley, California 94720, USA
#(TEL: +1 (415) 642 7782. TELEX: 9103667114 UC BERK BERK) (18, 30)

KLEIN, Dr. W., Fraunhofer-Institut für Toxikologie und Aerosolforschung,
Institutsteil Grafschaft, D-5948 Schmallenberg, Federal Republic of Germany
#(TEL: +49 (2972) 494-96. TELEX: 841520 D) (13, 16, 33)

LOENING, Dr. K. L., Chemical Abstracts Service, POB 3012, 2540 Olentangy River Road,
Columbus, Ohio 43210, USA
#(TEL: +1 (614) 421 3633. TELEX: 684-2086) (11, 12, 13, 24)

LÜCK, Dr. E., Hoechst AG, Forschung und Entwicklung Lebensmitteltechnik, D 729,
Postfach 800320, D-6230 Frankfurt/Main 80, Federal Republic of Germany
#(TEL: +49 (69) 3055542. TELEX: 41234-0 HOEAG D) (32)

MOLIN, Prof. Yu. N., Institute of Chemical Kinetics, Siberian Branch of Academy
of Sciences of USSR, SU-630090 Novosibirsk 90, USSR
#(TEL: +7 (3832) 654 150) (16, 17)

#SALBU, Dr. BRIT, Nuclear Chemistry Division, Department of Chemistry,
University of Oslo, POB 1033, Blindern, Oslo 3, Norway
(TEL: +47 (2) 455482) (27)

SCHNEIDER, Dr. W. G., National Research Council of Canada, 100 Sussex Drive,
Ottawa, Ontario K1A 0R6, Canada
#(TEL: +1 (613) 993 9821. TELEX: 533715 NRC OTT CA) (v, 10)

SLOAN, Mr. T. E., Chemical Abstracts Service, POB 3012, 2540 Olentangy River Road,
Columbus, Ohio 43210, USA
#(TEL: +1 (614) 421 3600. TELEX: 684-2086) (19)

STEYN, Dr. P. S., National Chemical Research Laboratory, Council for Scientific
and Industrial Research, PO Box 395, Pretoria 0001, Republic of South Africa
#(TEL: +27 (12) 869211. TELEX: 3-21312 SA) (32)

#WAGMAN, Mr. D. D., 7104 Wilson Lane, Bethesda, Maryland 20817, USA (15)

WEISSBACH, Dr. O., Beilstein Institut für Literatur der Organischen Chemie,
Carl Bosch Haus, Varrentrappstrasse 40-42, D-6000 Frankfurt/Main 90,
Federal Republic of Germany
#(TEL: +49 (69) 7917252) (21, 22)

WEST, Prof. T. S., Macaulay Institute for Soil Research,
Craigiebuckler, Aberdeen AB9 2QJ, UK
#(TEL: +44 (224) 38611. TELEX: 73458 UNIABN G) (v, 10, 11, 13)

Deletions:

Dr. N. G. Bazán (resigned) [p. 33, NR VI.3]

Dr. T. D. Coyle (resigned) [p. 12, Member IDCNS; p. 19, Secretary II.2]

Dr. J. G. Hill [p. 6, Secretary of IFCC; p. 35, Representative of IFCC on Div. VII] (replaced by Dr. M. M. Mueller)

Prof. K. V. Kordesch [p. 7, Secretary General ISE] (replaced by Prof. M. Breiter)

Prof. B. Rånby [p. 23, Coopted Member Div. IV not NR]

Prof. H. A. Scheraga (resigned) [p. 23, Representative of IUPAB on Div. IV]

Dr. G. S. Sidhu (resigned) [p. 10, Member CHEMRAWN Committee]

Prof. L.-O. Sundelöf (resigned) [p. 24, AM IV.1]

# CURRENT PROGRAMMES

## CLINICAL CHEMISTRY DIVISION (VII)

### COMMISSION ON QUANTITIES AND UNITS (VII.2)

| PROJECT TITLE | | COORDINATOR | STARTING DATE | COMPLETION OR * REVIEW DATE |
|---|---|---|---|---|
| 13/84 | Glossary of Terms on Quantities and Units in Clinical Chemistry | L.F. Bertello | 1984 | 1986 |

### COMMISSION ON TOXICOLOGY (VII.4)

### SUBCOMMITTEE ON NICKEL

| | | | | |
|---|---|---|---|---|
| 6/84 | Guidelines for the Preparation and Characterization of Nickel Compounds used in Toxicological Research | K.S. Kasprzak<br>D. Dewally | 1984 | 1987 |

# New And Recent Titles From The PERGAMON SERIES IN ANALYTICAL CHEMISTRY

---

## THE ANALYSIS OF PLASTICS

**T R CROMPTON**

This book aims to cover all aspects of the analysis of plastics using chemical and physical methods of analysis and provides a complete review of world literature on the subject. In many instances, and certainly in the case of major techniques, the book gives sufficient detail of methods to enable the reader to work direct from the book without recourse to the original literature.

**Contents:** Polyethylene and copolymers. Polypropylene. Higher polyalkenes and copolymers. Polystyrene and poly-methylstyrene and copolymers. Polyvinyl chloride, polyvinylidene chloride and other chlorine containing polymers and copolymers. Polymethylmethacrylates, polyacrylates, polymethacrylates and copolymers. Polybutadienes. Polyesters and polyethers. Polyvinyl alcohol and polyvinyl acetate and copolymers. Nylons, caprolactams. Polyacrylonitriles, polyacrylamides. Polyurethanes.

**X:** *Pergamon Series in Analytical Chemistry, Volume 8*
400 pp approx 228x152 mm Autumn 1984
0 08 026251 1 Hardcover **£29.50 US$49.50**

## THE ANALYSIS OF GASES BY CHROMATOGRAPHY

**C J COWPER** and **A J DEROSE,** *British Gas Corporation, Research and Development Division, London, UK*

*"Cowper and DeRose bring up-to-date, in a concise and comprehensive manner, the technique, equipment, and applications of analysis of gases by gas chromatography. This book is an excellent extension to the classic book by P G Jeffrey and P J Kipping,* Gas Analysis by Gas Chromatography *(2nd ed., 1972). It is well written and easy to read, even for a beginner in the field. Thorough coverage is given to the types of equipment, techniques of analysis, analysis of gas mixtures, and applications to a variety of problems. An extensive bibliography is provided. Those interested in industrial gas analysis and environmental gas analysis applications will find this book extremely useful. Recommended for the undergraduate library."*

**Choice** (1984)

**X:** *Pergamon Series in Analytical Chemistry, Volume 7*
159 pp 84 illus 190 lit refs 1983(Reprinted 1984)
0 08 024027 5 Hardcover **£14.00 US$25.00**

## COMPUTERS IN ANALYTICAL CHEMISTRY

**P G BARKER,** *Department of Computer Science, Teeside Polytechnic, Middlesborough, UK*

*"Many important concepts — such as interfacing, data collection, data bases, information services and computer networks — are covered in an easily assimilated and comprehensive way."*

**Chimie Flash** (1983)

*"(Barker) has written a book, free from unnecessary use of jargon, that serves as an excellent source for the analytical chemist who wishes to find out what computers can offer."*

**Analyst** (1984)

**X:** *Pergamon Series in Analytical Chemistry, Volume 6*
488 pp 237 illus 835 lit refs 1983
0 08 024008 9 Hardcover **£37.50 US$75.00**

## APPLIED COMPLEXOMETRY

**R PRIBIL,** *Czechoslovak Academy of Sciences, Prague, Czechoslovakia*
Translation Editor: **R CHALMERS,** *University of Aberdeen, Scotland, UK*

*"This book...is in many respects a memorial to the author's skill as a chemist and to his enormous knowledge of chemical reactions and how to manipulate them. However, it is not a memorial in the sense that it is dated or a thing of the past. It is lively in its approach, up-to-date and likely to remain a current book for a greater number of years than most of those now appearing on the analytical bookshelf....No respectable "complexometrist" should be without this book."*

**Analyst** (1983)

**X:** *Pergamon Series in Analytical Chemistry, Volume 5*
425 pp 1651 lit refs 1982
0 08 026277 5 Hardcover **£48.00 US$75.00**

**FREE EDUCATORS' TEXTBOOK INSPECTION COPY SERVICE**
These textbooks are available on 60 days approval. Educators are entitled to a 10% discount or, if course adoption or recommendation results in the sale of 12 or more copies, the book may be retained free of charge. Please write for details.

**X** = books published in Series. Standing/continuation orders invited. A list of published volumes in each Series is available free on request.

Prices are subject to change without notice.
Sterling prices apply to UK and Eire customers only.

---

**PERGAMON PRESS**

**Headington Hill Hall, Oxford OX3 0BW, UK**
**Fairview Park, Elmsford, New York 10523, USA**

CHE 149 5A 29 9 84

Send for your FREE Inspection Copy today!

IT'S TIME TO PROVIDE YOUR STUDENTS
WITH A FRESH APPROACH TO THE WORLD OF CHEMISTRY

# CHEMISTRY OF THE ELEMENTS

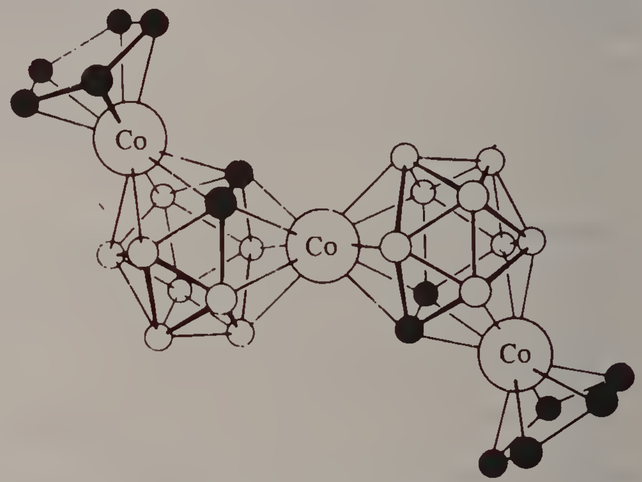
NORMAN N GREENWOOD and ALAN EARNSHAW
*University of Leeds, UK*

**An entirely new and comprehensive treatment of the chemistry of the elements for undergraduate and graduate courses in inorganic chemistry and related areas, including nuclear chemistry, geochemistry, mineralogy and solid state chemistry.**

**Choose this text and your students will:**

* discover not just "inorganic" chemistry but also analytical, industrial, organometallic, bio-inorganic chemistry and more.
* be taken systematically through the abundance, properties, reactions and uses of the elements and their compounds.
* be using a text with a new educational approach developed over several years by the authors with proven success.
* have access to the whole of inorganic chemistry through 1500 carefully selected references.
* understand chemical structures, properties and reactions more readily by means of superb illustrations.
* be provided with clearly highlighted supplementary information to enhance their knowledge of the subject.
* tackle questions usually ignored in other textbooks such as:
  Where do the elements come from?
  How were they made?
  Why do they have their observed terrestrial abundances?
  What determines their atomic weights?
* appreciate a wealth of technical information, much of which has been supplied by chemical firms worldwide on manufacture and usage.
* benefit from valuable appendices, including Atomic Weights, SI Units, Physical Constants, Atomic Orbitals, Symmetry Elements, Symmetry Operations and Point Groups.
* learn from the numerous tables and figures throughout the text.

**PERGAMON PRESS**



**Extracts from pre-publication reviews**

*"I approve with enthusiasm the stated objective of incorporating into the book the actual chemistry of the elements regardless of the source of that chemistry...the book should be an excellent one both for reference and for use at the senior undergraduate and graduate levels."*

**Professor R M Izatt,**
Brigham Young University, USA

*"I have no doubt that this book will become a standard reference for many years to come. All those who intend to follow a career in chemistry, or in a related science, will find it invaluable as a source of information not only while they are undergraduate or postgraduate students but also during their subsequent employment."*

**Professor F G A Stone, FRS,**
University of Bristol, UK

| | | |
|---|---|---|
| 1542 pp | over 3000 illus | 250 x 172 mm |
| 1500 lit refs approx | | April 1984 |
| 0 08 022056 8 Hardcover | | **£53.00 US$95.00** |
| 0 08 022057 6 Flexicover | | **£19.50 US$34.95** |

**EDUCATORS ARE INVITED TO ORDER AN INSPECTION COPY ON 60 DAYS' FREE APPROVAL**
(Educators are entitled to a 10% discount or, if course adoption or recommendation results in the sale of 12 or more copies, the book may be retained free of charge.)
Prices are subject to change without notice.

Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

*Now available on Microfiche*

The International Database of Commercially Available Chemicals

# FINE CHEMICALS DIRECTORY

*Available*
*ONLINE ★ On MICROFICHE ★ On MAGNETIC TAPE*

**Easy to use**

**Direct access to information on commercial availability**

**Eliminates hours of manual searching through individual suppliers' catalogues**

**Requires no special indexing or chemical knowledge**

**Fully cross-referenced**

**Of use to chemists, technical librarians, information scientists, chemical purchasers and planners, health and safety officers**

The *Fine Chemicals Directory (FCD)* is a comprehensive easy-to-use source of information about the suppliers of organics, biochemicals, dyes and stains in laboratory quantities. The *FCD* is not a file of bibliographic references but a databank which gives you answers. If you need a particular chemical for research purposes, *FCD* enables you to locate a supplier and provides you with the relevant address information.

Now available in microfiche, the *FCD* database has been available online exclusively through Pergamon InfoLine since 1982. The file now contains 174,000 catalogue entries covering approximately 80,000 compounds available, providing cross-references, synonyms, molecular formulae, details on purity and supplier information. American and European suppliers are covered, including large suppliers offering a wide range of products, as well as small suppliers offering specialized classes of compounds.

The *FCD* is subject to continuous assessment and is updated both by revision within the database and by the addition of further catalogues. A handbook giving details of suppliers, agents and types of compound indexed, together with notes on the file contents, is available to every user.

FOR FURTHER DETAILS ON THE SERVICES AVAILABLE AND THE SUBSCRIPTION RATES PLEASE WRITE FOR A FREE FULLY DESCRIPTIVE LEAFLET.

Orders and enquiries in connection with Microfiche should be directed to:

PERGAMON PRESS, Headington Hill Hall,
Oxford OX3 0BW, UK
PERGAMON PRESS, Fairview Park, Elmsford,
New York 10523, USA

For information on Online Searching, please write to:

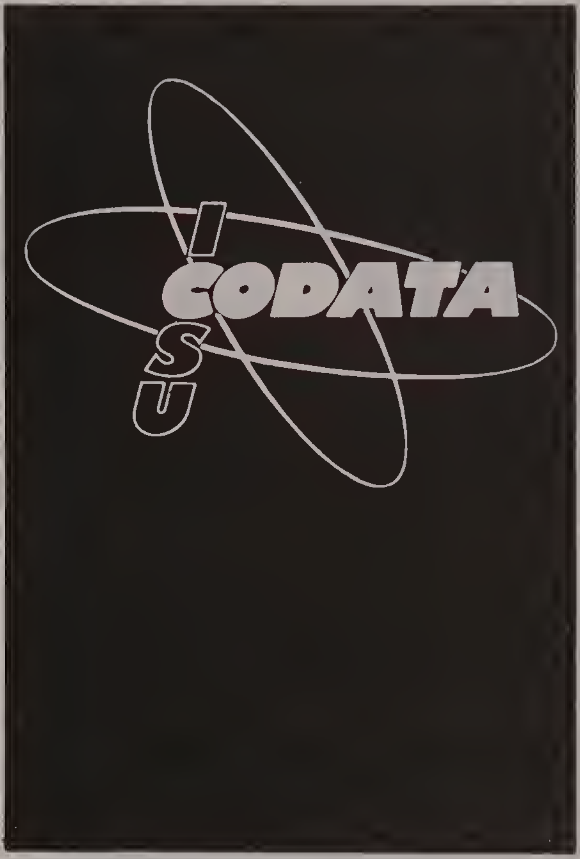
PERGAMON INFOLINE LTD, 12 Vandy Street,
London EC2A 2DE, UK
PERGAMON INFOLINE INC, 1340 Old Chain
Bridge Road, McLean, Virginia 22101, USA

Orders and enquiries in connection with Magnetic Tape Leasing should be sent to:

FRASER WILLIAMS (SCIENTIFIC SYSTEMS) LTD,
Glendower House, London Road South,
Poynton, Cheshire, UK

**Developed by Fraser Williams (Scientific Systems) Ltd**
**Disseminated by the Pergamon Group of Companies**

CHE146/8.84/5A28



## CODATA BULLETIN

Editor: P S GLAESER, *CODATA Secretariat, 51 Boulevard de Montmorency, 75016 Paris, France*

The *CODATA Bulletin* is an interdisciplinary journal which publishes conference proceedings on the subject of data in science and technology, research papers, and CODATA reports on new developments in data handling and presentation.

In addition the *Bulletin* regularly publishes the CODATA *Directory of Data Sources for Science and Technology,* a concise directory of data centres and other formal projects which serve as sources of quantitative numerical data on properties of well-defined physical and chemical systems.

CODATA is an interdisciplinary Committee of the International Council of Scientific Unions. CODATA's purpose is to promote data compilation and evaluation, to improve the quality of data collections and their usefulness to the user community, and to improve data accessibility.

**Subscription Information**
6 issues per annum (Volume - 1985)

| | |
|---|---|
| Annual subscription (1985) | **US$50.00** |
| Two-year rate (1985/86) | **US$95.00** |

**Some recent issues**

A Systematic Approach to the Preparation of Thermodynamic Tables (Report of the CODATA Task Group on Internationalization and Systematization of Thermodynamic Tables).
CODATA Directory of Data Sources for Science and Technology, Chapter 7: Nuclear and Elementary Particle Physics.
CODATA Directory of Data Sources for Science and Technology, Chapter 8: Atomic and Molecular Spectroscopy.
Data on Natural Resources — Their Use for the Development of Society.
Guide for the Preparation of Thermodynamic Tables and Correlations of the Fluid State.
CODATA Directory of Data Sources for Science and Technology, Chapter 10: Geodesy.
CODATA Directory of Data Sources for Science and Technology, Chapter 9: Snow and Ice.

FREE SPECIMEN COPIES AVAILABLE ON REQUEST
Advertising rate card available on request. Back issues and current subscriptions are also available in microform.
Prices are subject to change without notice. Journal prices include postage and insurance. Sterling prices are available to UK and Eire customers on request.

**Pergamon Press**
Headington Hill Hall, Oxford OX3 0BW, UK
Fairview Park, Elmsford, New York 10523, USA

5/1/5/84

**Chemistry International**

is the news magazine of the

# INTERNATIONAL UNION of PURE and APPLIED CHEMISTRY (IUPAC)

---

*President:* W. G. SCHNEIDER *(Canada)*
*Vice-President:* C. N. R. RAO *(India)*
*Secretary-General:* T. S. WEST *(UK)*
*Treasurer:* A. BJÖRKMAN *(Denmark)*

**IUPAC Secretariat**
Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)

Telephone: + 44 (865) 717744
Telex: 83147 attn. IUPAC  Telegrams: IUPAC OXFORD

---

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:
to promote continuing co-operation among the chemists of the member countries;
to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
to co-operate with other international organizations which deal with topics of a chemical nature;
to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 45 countries, each represented by a national organization, such as an academy of science or research council.

---

## NATIONAL MEMBER ORGANIZATIONS

Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
Asociación Química Argentina **(Argentina)**
Australian Academy of Science **(Australia)**
Verein Österreichischer Chemiker **(Austria)**
Comité National Belge de Chimie **(Belgium)**
Associação Brasileira de Química **(Brazil)**
Bulgarian Academy of Sciences **(Bulgaria)**
National Research Council of Canada **(Canada)**
Chinese Chemical Society, and Chemical Society located in Taipei, China **(China)**
Ministerio de Minas y Petróleos **(Colombia)**
Academia de Ciencias de la República de Cuba **(Cuba)**
Czechoslovak National Committee of Chemistry **(Czechoslovakia)**
Det Kongelige Danske Videnskabernes Selskab **(Denmark)**
Suomen Kemian Seura **(Finland)**
Comité National Français de la Chimie **(France)**
Deutscher Zentralausschuss für Chemie **(Federal Republic of Germany)**
Akademie der Wissenschaften der DDR **(German Democratic Republic)**
Association of Greek Chemists **(Greece)**
Hungarian Academy of Sciences **(Hungary)**
Indian National Science Academy **(India)**
Iraqi Chemical Society **(Iraq)**
Royal Irish Academy **(Ireland)**
Israel Academy of Sciences and Humanities **(Israel)**
Consiglio Nazionale delle Ricerche **(Italy)**
Science Council of Japan **(Japan)**
Malaysian Institute of Chemistry **(Malaysia)**
Koninklijke Nederlandse Chemische Vereniging **(Netherlands)**
Royal Sociey of New Zealand **(New Zealand)**
Norsk Kjemisk Selskap **(Norway)**
Sociedad Química del Perú **(Peru)**
Polska Akademia Nauk **(Poland)**
Sociedade Portuguesa de Química **(Portugal)**
Korean Chemical Society **(Republic of Korea)**
Council for Scientific and Industrial Research **(Republic of South Africa)**
Academia Republicii Socialiste România **(Romania)**
Consejo Superior de Investigaciones Científicas **(Spain)**
Svenska Nationalkommittén för Kemi **(Sweden)**
Schweizerisches Komitee für Chemie **(Switzerland)**
Supreme Council of Sciences **(Syrian Arab Republic)**
Türkiye Kimya Dearneği **(Turkey)**
Academy of Sciences of USSR **(USSR)**
Royal Society **(United Kingdom)**
National Research Council, National Academy of Sciences **(USA)**
Instituto Venezolano de Investigaciones Científicas **(Venezuela)**
Unija Hemijskih Društava Jugoslavije **(Yugoslavia)**

# Chemistry International

IUPAC

## Contents 1984, No. 6 (December)

1 Editorial
2 Official Publisher to the Union
3 The Secretary General's Column
8 Activities of Division II
9 150th Anniversary of D. I. Mendeleev
13 FECS General Assembly
14 Division Presidents' Reports to the Bureau
17 Conference on infant formula; International Conference on Rare Earth Development and Applications
18 Mendeleev and the periodic classification of the elements
31 ICSU Committee on Space Research; Asian Chemical Conference 1985
32 Prof. I. M. Kolthoff; IUPAC people
33 Professional workers and trade unions
36 *Pure and Applied Chemistry*
37 Provisional Recommendations
38 ICSU General Assembly 1984
42 Sources of IUPAC-approved terminology
47 IUPAC-sponsored Conferences
48 Recent reports
49 Other people's publications
50 Summary minutes of Committee and Commission meetings
53 IUPAC Conferences
55 Farewell to Pergamon
56 Revisions to *IUPAC Handbook*

ISSN 01

Printed by The Nuffield Press Limited, Oxford.